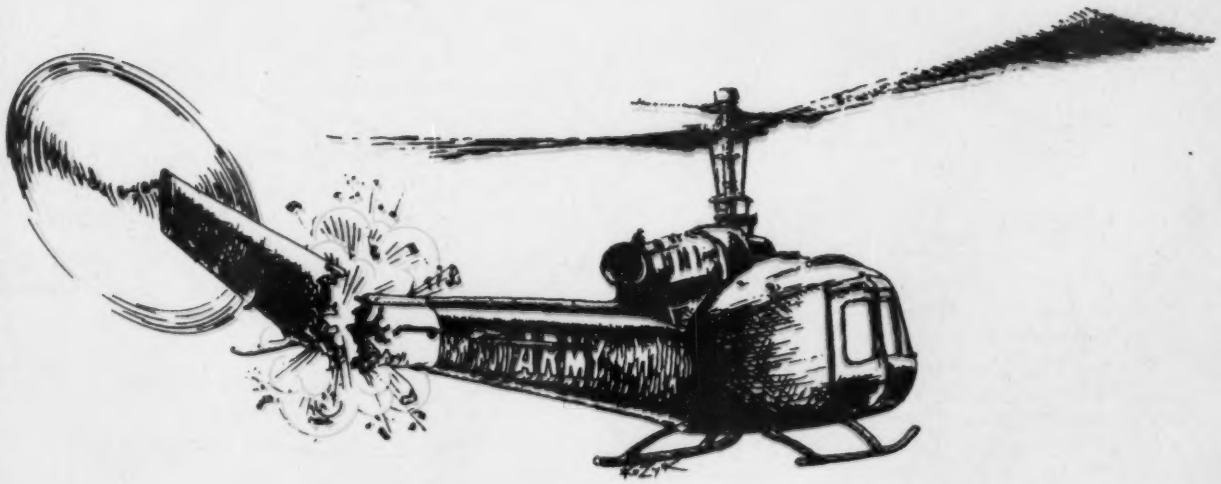
UNITED STATES ARMY NOVEMBER 1976

AVIATION DIGEST



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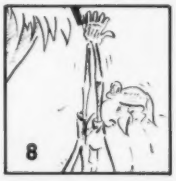

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Inspector General and Auditor General
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ABOUT THE COVER

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The mission of the *U.S. ARMY AVIATION DIGEST* is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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Increased Responsibility For Army Aviators

The sophisticated future family of helicopters, AAH (contenders shown above, Bell at left and Hughes), the UTTAS and ASH, in conjunction with the stresses of flight in the NOE environment will task flight crews and ground support personnel to the limit

Brigadier General Charles E. Canedy
Deputy Director of Operations and Army Aviation Officer
Office of the Deputy Chief of Staff for Operations and Plans
Washington, DC

TODAY ARMY aviation, like other components of the combined arms team, is faced with constraints which pose considerable challenges for today's Army Aviator. The ever increasing cost for hardware and training compared with constant or reduced budgets, as well as reduced manpower ceilings during a period when we see greater demands for 24-hour operation on a high threat battlefield, make responsibility weigh heavy on the shoulders of the Army Aviator.

Our current doctrine is oriented toward a high threat battlefield. As the threat changes or is redefined, tactics and hardware must be developed to provide a high assurance that successful operations can be conducted. Both quality and quantity of enemy air defense weapons have forced Army aviation from altitudes out of the range of small arms fire down to the nap-of-the-earth (NOE) environment.

Aircraft operation in the NOE environment is the most demanding and fatiguing scenario our Aviators have been placed in to date. Every step in aircraft operation from planning, preflight, mission execution and post flight demands a 100 percent professional performance of the entire crew as well as ground support personnel. Anything less is unacceptable and lays the groundwork for an incident, accident and/or unsuccessful mission. Flying NOE is a serious business and we would not be flying at this altitude if it were not dictated by the threat.

The potential for disaster is sharply increased with the reduction of identification and reaction time. A chaffed hydraulic line that is not discovered on preflight and subsequently fails inflight creates much less of a problem at 500 feet than it does at 3 feet. Your responsibility for a thorough knowledge of emergency procedures is paramount. (With approximately 5 seconds from indication to touchdown—you better be right!) An incomplete crew briefing by the pilot may not be as critical when performing a service mission at

Continued on page 9

Key extracts from an address by Major General Eivind H. Johansen, Commanding General, USAAVSCOM, to aviators in his command

A COMMANDER SPEAKS TO HIS AVIATORS ON AVIATION SAFETY

THIS IS NOT THE usual after dinner or luncheon speech. It will not start or end with a joke—because my subject's too serious for that. It's about "you" and aviation safety. I wanted to talk to you personally—as individual aviators—for the simple reason that flying safety begins and ends with the individual aviator.

First, let me say that I know that your job is inherently dangerous. It may be viewed as exotic by some, but I know that it's one of the most professionally demanding jobs in the Army. I'm aware of additional personal burdens, such as extra insurance you carry, and I appreciate the fears and stresses that your family may have from time to time. All of these things, most urgently, argue for the utmost care and caution in the aviation business. It demands the most positive

Major General Eivind H. Johansen, Commanding General of the U. S. Army Aviation Systems Command, has been vitally concerned with the safety of personnel and equipment of the military services for many years. Previous assignments have included duty as Director of Supply at DARCOM Headquarters, and duty with the Office of the Deputy Chief of Staff for Logistics—where he became the Army's expert on the redeployment of U.S. troops from Vietnam and the Army's Vietnamization logistics program. He attended graduate schools at Harvard and George Washington Universities, receiving his Master of Science degree in International Relations from the latter in 1968.

USAAAVS

A COMMANDER SPEAKS

attitude toward flying safety. It demands *discipline*. It demands that we follow correct *procedures*.

It's "attitude" that I particularly want to stress. I've carefully evaluated the facts surrounding recent aircraft accidents—looking at each accident independently—and they all add up to the same conclusion. Pilot error has been a major or contributing cause in every accident in our organization. As you know, I've initiated a series of actions, designed to—very frankly—get the attention of all aviators; and to firmly establish procedures and standards to bring us up to a state of *disciplined* professionalism. About this time some of you are thinking "He's not talking to me—he's talking to the guy next to me!" Wrong! I'm talking to you, you, and YOU! Let me emphasize the context in which I'm using the word "discipline." It means self-discipline. It means never deviating from the fundamentals of good judgment, precise control and prudent safeguards. It means following procedures and avoiding risky shortcuts.

Now let's get back to "attitude." I recently established a board of senior aviators in the command to check out our testing and safety programs. They, too, agree that we must police ourselves and that we must begin with "attitude." By attitude, I mean the aviator's view of himself, your view, if you will, in relation to the flying environment. It boils down to this:

- If you can't objectively analyze your perceptions—you're a problem!
- If you feel that your status as pilots, or flight engineers, places you above the standard rules—you're a problem!
- If your ego prevents you from strict compliance with safe procedures—you're a problem!
- And if you don't think we have a problem—you're *really* a problem!

Again, some are probably thinking, "He's not talking about me! I'm not a problem!" Wrong again! I *am* talking about you—about us—and our accident experience, which needs improvement. I well recognize that there's more involved than the points I've just made. Other related issues are involved—engineering analysis, safety of flight releases, preflight inspections, command supervision, control of remote operations, pilot proficiency and standardization. These issues have all been brought out by accident investigation boards, collateral investigations, my own board of officers and, most recently, a team which is investigating the safety situation at contractor activities.

Through this mass of fact and detail the same story can be gleaned over and over again. We've become complacent. We have a problem and that problem must be corrected without delay. I expect action. Action to get ourselves right with the world. Action to ensure safety. Action to stop accidents. If any aviator can't discipline himself—if it's too hot in the kitchen—then it's time for that aviator to turn in his badge. That's basically the situation—plain and unvarnished.

Now let me add—you're not alone. The accident profiles throughout the Army are not good. The whole Army has slipped. This tells me something. Something important. We, the Army, have a job to do, to bring our flying safety standards back up to an acceptable, professional level—to improve *attitude*, to improve *discipline*, to improve and *follow procedures*.

This, then, is my direction to you:

a. I do *not* want you overworked. It's tough enough for you to do your job without being fatigued. Crew rest is important.

b. I do *not* want you to take unnecessary risks. Your work is hazardous enough, without cutting the odds by imprudent, unwise or downright foolish actions.

c. I do *not* want you to feel, in any way, that you've passed beyond the need to practice fundamental skills.

d. I *do* want you to plan your operations carefully—
- Use backup safeguards.
- Be fit to fly.
- Be sensible.
- Be safe.

e. I *do* want you to be proficient—
- Know emergency procedures.
- Fly only in proper weather, within the capability of your aircraft and your ability.

f. I *do* want you to know what you're doing in any test flight situation. Thoroughly understand the test before you start. If you don't, don't fly.

You have my support. I want you to know that I understand and appreciate the extra hazards of your business. I want you to understand my concern. And knowing that, you'll understand my sincere determination to spare no effort in making your job a safe one. Your dedication—of which I am assured—is the final, overall, most important element necessary to success.

Now, take a moment and think about what I've said. I've given you—restated—in my own words, nothing more than the cardinal rules for safe flying. You learned those rules as student pilots. In short, gentlemen, you've only to practice the most fundamental precautions—and you'll be safe and successful—rather than sorry.

Ted Kontos
Publications and Graphics Division
USAAAVB U. S. Army Agency for Aviation Safety

Fly-it-and watch-it attitude resulted in fractured link of silent chain, loss of antitorque control and crash.

SPOTLIGHT ON MAINTENANCE

WHILE TAKING HIS evening stroll, a man came upon a young boy who was on his hands and knees apparently searching for something in the grass. "What are you looking for, son?" the man asked.

The youth stopped what he was doing, turned his head toward the stranger, and replied, "I lost a quarter and I'm trying to find it."

"Well," drawled the man, "where did you lose it?"

"Over yonder," the boy retorted, pointing with his finger.

Chuckling, the man made one further inquiry, "If you lost it over there, then why are you looking for it over here?"

"Because the light is a lot better over here," came the reply.

Although this tale comes from out of the past, it does have something of value to

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Within the past decade, U.S. Army aircraft have been required to perform combat roles where they have been exposed to extremely diverse air defense threats. In general, these threats in various combat operations have been comprised of automatic weapons (7.62 to 14.5 mm), antiaircraft artillery (23 to 57 mm), surface-to-surface antitank weapons, surface-to-surface missiles and airborne interceptors. It should become increasingly apparent, then, that Army aircraft survivability, and the means to achieve it, can and must be pursued if the Army's combat and combat support aircraft are to continue to operate on the modern battlefield, which may include undefined future threats. Additionally, aircraft survivability means that an active and comprehensive research and development effort must be maintained to ensure that the Army can deal with all of the current as well as anticipated enemy threats.

This article is not intended to reflect those concepts or describe those features which will serve as a remedy for nonsurvivability. Rather, it is intended to express the philosophy, approach, problems, issues and current status of this highly challenging field. The above aspects, as well as those following, reflect the author's personal research, experience, knowledge and appreciation gained while serving as a research and development coordinator/aerospace engineer for the past 3 years with the Safety and Survivability Technical Area of the Eustis Directorate, U.S. Army Air Mobility Research and Development Laboratory (USAAMRDL), Ft. Eustis, VA.

ARMY AIRCRAFT SURVIVABILITY

RDTE Program Descriptions

Aircraft Survivability Concepts: This project is directed toward advanced development of passive aircraft survivability equipment for Army aircraft when operating in a hostile air defense environment composed of radar, infrared (IR) and optically directed weapons.

Aircraft Survivability Equipment: Objectives of this task are engineering development, test and type classification for production required aircraft survivability systems composed of selected aircraft survivability equipment which have demonstrated feasibility in advanced development.

Aircraft Electronic Warfare Self-Protection Equipment: Objective of this project is to establish the technical feasibility and military potential of electronic countermeasures equipment and electronic warfare support measures equipment for protection of Army aircraft in a hostile air defense environment composed of radar, infrared (IR) and optically directed weapon systems.

Aircraft Electronic Warfare Self-Protection Systems: The objectives of this project is the engineering development of airborne aircraft self protection electronic warfare equipment to deny or degrade the enemy the use of his electromagnetic anti-aircraft weapon directing devices.

Joint Survivability Investigation: This project supports the Army position of interservice efforts of the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) to reduce vulnerability of aeronautical systems in a non-nuclear threat environment. The JTCG/AS effort is intended to complement ongoing separate service work, to provide a vehicle for cross service aircraft survivability exchange and to develop design and specification criteria and standards for further aeronautical systems survivability equipment development.

MISSILE, MISSILE, missile," crackled across the radio from a staccato-voiced fireteam member, but the warning was too late.

The cracking thud, together with a concussion, knifed through the operational orientation of the gunship aircraft commander. The armed gunship, with the tailboom severed, entered a brief period of combined roll and pitch oscillations as the pilot instinctively entered autorotation. Miraculously, the crew survived to tell this story of an encounter between a 1960-technology helicopter and an infantry, handheld, infrared (IR) seeking Grail missile in a near mid-intensity (high threat) Vietnam environment (see "Missile, Missile, Missile," April 1975 *DIGEST*). U.S. military analysts took note.

In October 1973, war broke out again between Israel and its traditional enemies of Syria and Egypt. This latest (mid/high intensity, highly armored) air-oriented war further highlighted the weapon system capabilities of the Warsaw Pact nations. New weapon systems appeared on the battlefield as well as systems that were known but not battlefield tested. These systems,

Continued on page 12

Major N. I. Patla

Aerospace Engineer
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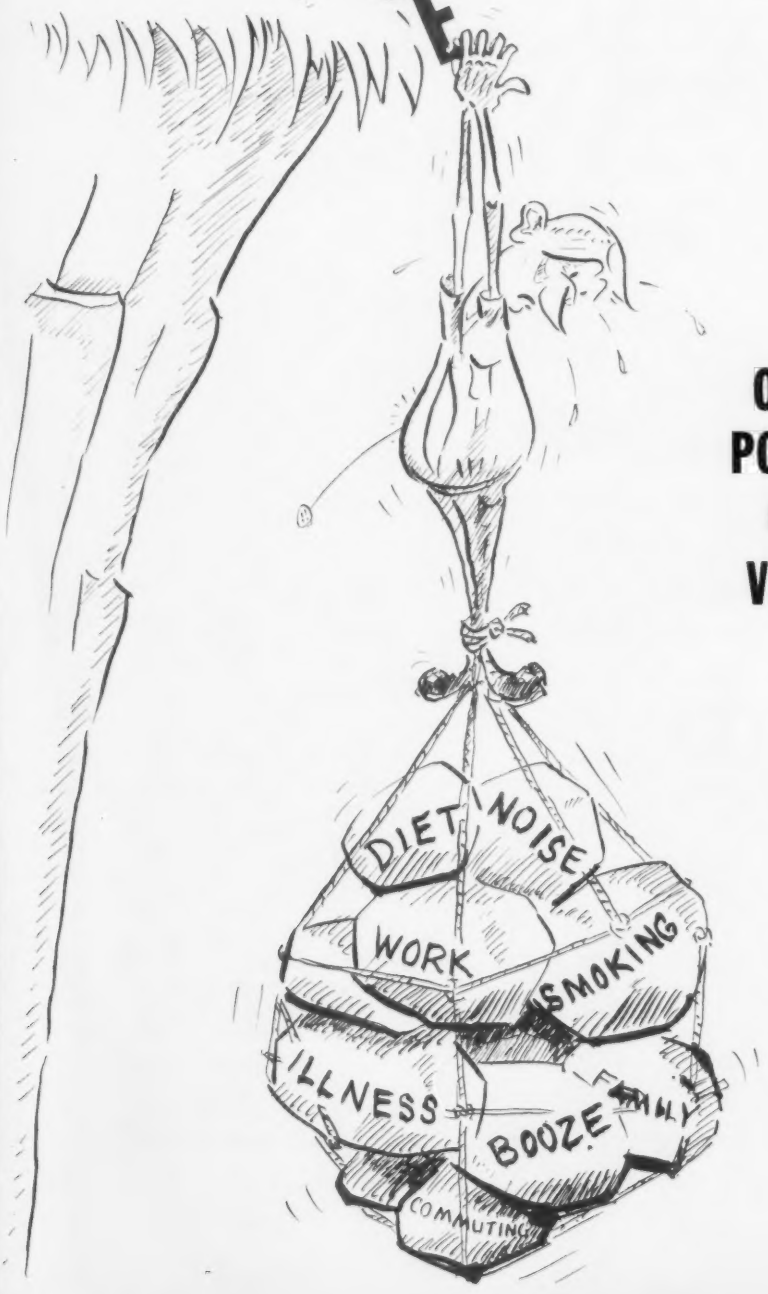
STRESS AND FATIGUE

LTC John J. Treanor, M.D.
Chief, Education and Training
U. S. Army Aeromedical Activity
Ft. Rucker, AL



ONE POINT OF VIEW

STRESSES CAUSE fatigue and fatigue causes aircraft accidents. There is some excellent guidance in AR 95-1 telling you how to avoid fatigue accidents. It is general guidance and there is a good reason for it not being more specific; attempts to be more specific would be misleading rather than helpful.

Some commanders have been asking for more specific guidelines. What they need are more flight surgeons to help them observe their Aviators. Unfortunately the Army will never have enough flight surgeons, especially in the near future.

Commanders never enjoy it when fatigue is named as a contributing cause of a fatal accident. It is particularly unpleasant when it is obviously due to the commander having overcommitted the unit in search for promotion ahead of the zone. Some of them shout for more specific flying hour limitations so that they can be sure fatigue can be avoided. Aviation medicine is tasked with producing these "magic numbers" to ensure safety.

Be assured that these magic numbers do not exist!

Fatigue tends to defy quantitative description.

Recognition of fatigue is an art form, not a science. Happily it does not have to be a difficult art. It has usually been well mastered by people like your parents who can tell if you are tired by just looking at you.

To convince you that it is a waste of time and effort to try to publish more specific guidelines, see the box (page 17) for the number of variables involved in producing fatigue.

All of these variables have been proven to influence how easily a given case might have fatigued while flying. In addition to these there remains the fact that people are not all the same. Some just tucker out easier than others. How in the world can you come up with

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UTTAS contender by Sikorsky Aircraft. . .

Increased Responsibility

Continued from page 1

altitude as opposed to flying NOE. (Don't read between the lines—I am not saying thorough crew briefings are required only if you are conducting NOE operations.) Successful NOE operation simply cannot be conducted without study; physical and mental conditioning; individual, crew and unit training.

We continue to pay a high price for NOE training and qualification. Our blade strike incidents are relatively high and blades that can attack a tree and come out the winner will not be in the field for many months. The philosophy expressed by a few that accidents are unavoidable in combat is just as unacceptable in planning and conducting an NOE operation as it was in the Republic of Vietnam. As the operator in this environment your responsibility is indeed great. You must know your individual ability and capability as well as that of your crew, for teamwork more than ever before is the key to success. Your greatest responsibility is to continually work to enhance your ability.

We no longer speak of aircraft cost in terms of thousands of dollars, but rather in terms of millions of dollars. Looking to our future family of helicopters—with the advanced attack helicopter (AAH), utility tactical transport aircraft system (UTTAS) and advanced scout helicopter (ASH)—the research and development and procurement costs alone run into the hundreds of millions of dollars. Combine this with the yearly operating cost for fuel and repair parts and the cost for personnel, and you see that Army aviation is truly an expensive proposition.

It is essential that you realize that the machinery you operate represents a significant portion of the Army's total budget. If you own a 10-year-old Volkswagon, the degree of tender loving care (TLC) you exhibit is much less than if you own a new Jaguar. The TLC devoted to the Jaguar is what we need transferred to our aircraft and maintenance equipment. As you know our future family of helicopters is engineered and designed to provide greater survivability not only against the threat of enemy weapons, but also many problems faced when flying NOE. Greater standoff range for aerial weapons systems also is designed to enhance survivability. The projected tank threat on the high threat battlefield requires enhancement of the attack helicopter fleet, and this is being accomplished by modifying existing systems to the Cobra-TOW (tube-launched, optically-tracked, wire-guided) configuration. The price for increased survivability and improved aircraft systems is not cheap.

I have already addressed responsibility for system operation but would like to reinforce the point. The increase in responsibility becomes apparent when you think about firing a $10,000 missile as opposed to a $100 rocket. While planning for the future is necessary we must be capable of operating successfully on the high threat battlefield with what we have in the inventory right now.

During Army aviation operations in Vietnam, Army Aviators continuously demonstrated that they were the best in the world. Today's challenges are different, tactics are different, fiscal constraints are different. There is absolutely no doubt in my mind that Army Aviators will continue to demonstrate that we are the best in the world.

. . .and the competitor from Boeing-Vertol

OPMS CORNER

Officer Personnel Management System

Aviation Engineering And Flight Testing Program —A Challenge

Major Thomas M. Walker

Aviation Management Branch
Professional Development Division
Officer Personnel Management Directorate

ARE YOU interested in the development and acquisition of new aircraft? Do you like the research and development field? Do the technical aspects of aviation excite you?

If the answer to any one of the above questions is "yes," opportunity is knocking right now for qualified Army Aviators to participate in the Army's Engineering and Flight Testing Program. The growth and development of Army aviation has opened many doors to the career Army Aviator—command opportunity, advanced schooling, and research and development—to mention only a few. The door that leads to a career as an Army test pilot is open wider than ever and tenders challenging assignments and unique opportunities to Army Aviators who qualify for admission into the program.

Test Pilot Program Prerequisites: Army Aviators in the grade of major and below can apply for the program. While grade criteria may be waived, the following prerequisites are less flexible:

- Must be a rated Army Aviator on active duty and on flight status.
- Must be fixed and rotary wing rated with a minimum of 1,500 hours *military* flying time. The individual must have at least 500 hours rotary wing and 130 hours fixed wing aircraft time.
- Must be twin-engine fixed wing and turbine-powered rotary wing qualified. The aircraft qualification requirements include—but are not limited to—UH-1 Huey, OH-58 Kiowa, CH-47 Chinook and OV-1 Mohawk aircraft. Aircraft requirements may be waived; however, the applicant (if selected) will receive qualification training enroute to test pilot school training.
- Must possess current instrument rating.
- Must have completed college algebra, physics and calculus with above average grades. A college degree in engineering is desirable but not required.

Selection and Training: Selection of Army Aviators for participation in the program is made by an Officer Personnel Management Directorate (OPMD) board. Representatives of the OPMD Aviation Management Branch, OPMD Grade Divisions, Naval Test Pilot School (NTPS), and also the Army Engineering Flight Activity are included as board members.

Only those applications of officers who are recommended by their respective grade division are considered. Once selected and prior to attending NTPS, officers are sent TDY to the Army Test Pilot Orientation Course at the U.S. Army Aviation Engineering Flight Activity (USAAEFA), Edwards Air Force Base, CA. The orientation course length is about 60 days and is designed to provide academic and flight refresher training. Academic subjects include college math through calculus, physics, aerodynamics, engineering slide rule and technical report writing. Flight orientation includes high altitude environmental training, flight test techniques and familiarization in a number of aircraft used at NTPS.

The NTPS course consists of about 11 months of rigorous flight and academic training. Classes are held twice a year beginning in January and July. The Army's training quota for NTPS is nine per year (five in January and four in July); however, the number of officers trained is a function of requirements. Upon successful completion of the NTPS course, graduates are assigned to USAAEFA for duty as engineering test pilots or in staff positions involving decisions affecting the type, design and configuration of Army aircraft.

Officer Professional Development: Heretofore commissioned officer Aviators have been reluctant to participate in the test pilot program for fear that specialization

would limit their ultimate professional development. In reality nothing could be further from the truth. Under the Officer Personnel Management System (OPMS), test pilots are eligible to fill a wide range of research and development (R&D) requirements.

Following initial assignment at USAAEFA, test pilots are geared to the R&D field and are *not* limited to filling only test pilot positions. Their experience and skills represent a high dollar cost investment and require a closely monitored program of utilization and professional development. R&D test pilots are qualified for and will be assigned to both R&D and aviation (Specialty 15) positions. Like all OPMD managed officers, their careers will be managed under the dual specialty concept with school assignments, command opportunity and promotion potential being a function of how well they perform in each specialty.

Opportunities In Space Shuttle Program: The Space Shuttle Program will usher in a new era of space transportation in the 1980s opening the way to routine operations and expanded experimental investigations in space. This program is designed to provide the United States with an economical capability for delivering payloads of men, equipment, supplies and other spacecraft to and from space by reducing operating costs and order of magnitude below those of present systems.

The National Aeronautics and Space Administration (NASA) recently announced that applications for space shuttle astronaut pilots and mission specialists are now being accepted. A review of the selection criteria clearly indicates that test pilot personnel are excellent candidates for the program. The Army's position in terms of program support and selection procedures for Army personnel is under study at Department of the Army (DA) and should be announced to the field in the immediate future.

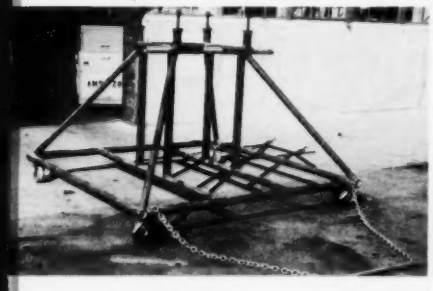
Army test pilots—whether working on a staff or performing engineering test flights—have both a challenging and rewarding military career. Army aviation is markedly influenced by their accomplishments in the aircraft research and development field. When a prototype finally becomes part of the Army's aircraft inventory, test pilots know their hard work helped put it there.

To become part of this elite group of Army Aviators, qualified officers should contact their respective OPMD grade division regarding application for the program. Additional information concerning the Aviation Engineering and Flight Testing Program can be obtained through contacting the Aviation Management Branch, OPMD, AUTOVON 221-0727/0794; commercial (202) 325-0727/0794.

New Transmission Removal Stand

HELICOPTER maintenance men will be happy to learn of an improved transmission and main rotor removal stand which was suggested and adopted a few months ago.

Designed and built initially by James I. Balough of the Army Aviation Maintenance Support Activity (AAMSA-28) at Los Alamitos, CA, use of the new stand has reduced by more than 80 percent the manhours required to remove a UH-1 helicopter transmission from the aircraft.



The Sweeney stand formerly used involved a total of 23 manhours for removal of the hub and blade assembly whereas with the new (Balough) stand the process takes only 3 hours. The time difference results in large part because all main rotor components can be placed in the new stand without removal beforehand. This includes the following assemblies: hub and blade; stabilizer bar; scissors and sleeve; swashplate and the support assembly.

According to the designer and information available, material cost for fabricating the Sweeney stand was in the vicinity of $1,700, while for the new stand the material cost just about 6 percent—or a total of $95.

The new stand has been used successfully for the past 2½ years by the AAMSA-28 maintenance personnel. Material costs for fabrication may be higher now than indicated, however, the estimated savings computed at the same time for removal of 20 transmissions per year—$2,115 also will have increased.

Another advantage that cannot be measured, said the designer, is the adaptability of the new stand for use with other types and sizes of helicopters by making only minor modifications.

Continued from page 7

engaging both air and armored targets, demonstrated various levels of success as well as limitations. U.S. military analysts again took note.

The future challenges facing Army aviation were amplified in the later stages of the war in the Republic of Vietnam (RVN) and were brought into better focus on Middle East battlefields. The survivability of the U.S. Army helicopters must be enhanced. Future Army air systems *must* be capable of living, fighting and *surviving* on the new battlefield!

Will Army aircraft survive on the next battlefield? This article addresses that subject by first looking at the existing threat; then by discussing ways to overcome the threat; and finally, by analyzing the unclassified survivability features of the newest helicopters that will provide combat support into the 1990s.

Aircraft survivability describes measures, active and passive, which will allow the aircraft to avoid being hit, but if hit will allow the aircraft to continue its mission. This includes those design and performance features that enable an aircraft, by avoidance or suppression techniques, to degrade a hostile force's ability to use its weapons effectively. With this description in mind, it is important to understand just what is taking place within the U.S. Army to enhance the survivability of helicopters in future conflicts.

The Army, recognizing the place of the helicopter on the future highly mobile battlefields, has undertaken the development of a total helicopter support system. This system includes a small advanced scout helicopter (ASH) in concept formulation; the utility tactical transport aircraft system (UTTAS) in prototype development; the advanced attack helicopter (AAH), also in prototype development; and last, the improved CH-47 Chinook medium lift helicopter (MLH) entering modernization.

The present generation of Aviators might ask themselves, "What good are all these new helicopters and aircraft if they are all going to be shot out of the sky?" A skeptic might ask, "How long will Army aviation last as a viable support element in a mid/high intensity war?" Some have theorized that existing Army aircraft in Europe would suffer 50 percent losses in the first 24 hours of full-scale hostilities.

To answer these questions and refute speculation, COL Jack L. Keaton, Project Manager for Aircraft Survivability Equipment (PM-ASE), in support of a concept of fielding survivable aircraft, has initiated RDTE (research, development, test and evaluation) programs of survivability design and development to be incorporated into all new aircraft systems (see box on page 7). Further, the tactics and methods of control that will maximize Army aviation combat effectiveness are being developed and tested today for application to present aircraft as well as to future systems. No longer will planners alter the mission to fit equipment designed for other purposes. Today the systems approach dictates an examination of all interrelated aspects of performance, reliability, maintainability and survivability. It calls for a balancing of the applications of these concepts within the constraints of what technology can produce, what the Government can afford, what the military needs (mission) and what the probable threat is.

What, then, is the probable threat? The 1973 Mideast War provided an arena within which many of the latest Russian antiaircraft systems appeared. For purposes here, it can be assumed that the normal variety of weapons through 12.7 mm can and will be expected in a mid-intensity environment and may very well include systems from 23 mm through the 57 mm S-60 towed or track-mounted antiaircraft gun. Given the constraints of technology, cost effectiveness and mission, the 23 mm weapon generally is considered as the upper limit threat for design purposes.

The ZSU-23-4 is a system that accounted for numerous Israeli aircraft losses. This system consists of four 23 mm guns mounted on a

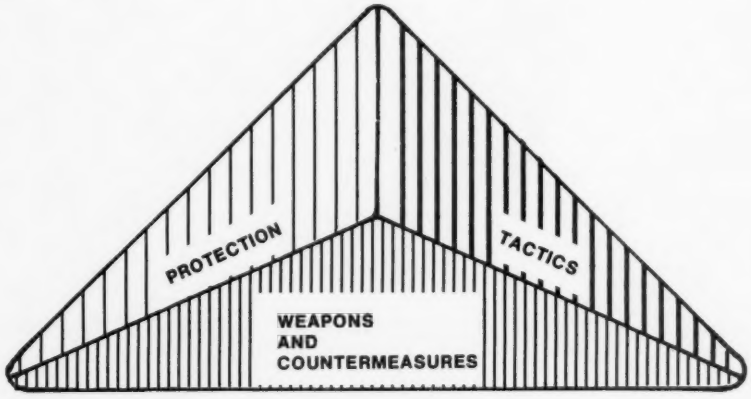


Figure 1
Survivability

tracked, armored vehicle and fired together under the guidance of a radar, whose very narrow beam provides excellent tracking while being difficult to detect and evade.

At nominal altitudes the modern battlefield also will present missile threats to helicopters, including the SA-2 Guideline, the SA-3 Goa, the SA-6 Gainful and the SA-7 Grail. In addition, the SA-8 Gecko and the SA-9 Gaskin (fully mobile, self-contained air defense systems) still under development can be expected to be fielded eventually. Because the SA-2 and SA-3 are relatively difficult to move on the modern battlefield and since the SA-8 and SA-9 have not yet been fully integrated into the Russian inventory, only the SA-6—the most formidable threat—will be discussed.

The Soviet Union, like the United States, is concerned with the future battlefield and the requirement for mobility. This concern has resulted in the development of a tracked-vehicle-mounted SA-6. The Gainful is a low-to-medium altitude missile that is radar guided and incorporates a unique propulsion system. It is mounted on a tracked vehicle with three missiles to a launcher assembly and an acquisition tracking radar in an accompanying tracked vehicle.

The systems previously discussed are typical of the level of threat that 1980 Army aircraft can be expected to face on the battlefield in the low altitude environment. However, there are a variety of ways to cope with a given threat.

The probability of an aircraft's survivability when exposed to a hostile threat is primarily dependent on the likelihood of detection, being hit if detected and knocked down if hit. Figure 1 depicts how protection, countermeasures and tactics combine in a sound triangular form to increase survivability. However, it should be understood that as the threat level increases, technology can only do so much. Ultimately the field commanders and pilots must rely more heavily on doctrine and tactics (i.e., terrain flying, night operations, etc.) if they are to survive.

It is important now that we examine the areas within the survivability triangle to determine the general makeup of each.

	Dynamic System	Structure	Pilot	Flight Control System Navigation	Propulsion System
Reduce Visual		X			
Reduce Aural	X				X
IR Signature	X				X
EM Signature				X	
Radar Cross Section	X	X			
Harden Components	X	X		X	X
Shield Components	X		X	X	X
Redundancy	X	X	X	X	X
New Concepts	X	X	X	X	X

Figure 2
Protection

Figure 2 is a matrix showing areas (X) where work is being done or has been done in the area of protection. To bring the myriad of programs that have been conducted into focus, some of the work currently being accomplished will be reviewed to see where it fits into the overall picture.

Visual and aural cues which

might key an enemy to the presence of a helicopter are considered together because the typically noisy helicopter stimulates an enemy to orient in the direction of the sound and then initiate a search. Problems of sun reflection or glint have been attacked as well as the noise problem. Under Government contract, studies and flight tests of an experimental model helicopter successfully demonstrated a reduction of rotor-induced sound pressure levels for a medium lift helicopter. Similarly, a more extensive treatment of a total system was subdued. The overall result is a substantial reduction in the time allotted for an enemy to detect, locate and engage an aircraft.

With respect to the IR signature of engines, the SA-7 threat in Vietnam stimulated several rush programs to counter this threat. Systems were fielded which provided most of the aircraft sufficient protection for continued operations. Ideally, however, the IR signature reduction system should be built-in rather than attached, as is now the case. Work in this area is ongoing and includes the development of techniques to reduce the signature of secondarily important helicopter components such as intermediate and tail rotor gearboxes as well as oil coolers. Similarly, current efforts are under way to reduce the electromagnetic signature of helicopters and to develop navigation and weapons systems that, to the greatest extent possible, minimize detectable radiation signatures.

Since most Doppler-based radar sensors are velocity gated at higher than helicopter speeds, even in a hover flight mode, they do sense moving rotor blades. The emphasis today, then, is on reducing the signature of aircraft through geometric shaping, using scatter plates and energy absorbing coatings, and applying transparent metallic films to windscreens and canopies. In addition active countermeasures such as electronic radar jamming may be necessary to deal with the remaining radar cross section.

In the area of vulnerability reduction one can add protection to aircraft by burying vulnerable components behind invulnerable ones, by concentrating vulnerable components in a small area, or by providing for redundancy or component hardening. Typical of the earliest approaches was to provide shielding in the form of armored vests and seats for crews, and parasitic armor for certain flight-essential components in the propulsion and other critical systems. Today, armor is still being used for those areas that cannot be hardened to withstand projectile impacts. Present day technology, however, has developed to the point where techniques exist to make ballistically tolerant structures, drive shafts and rotor blades. Furthermore, the traditionally vulnerable flight control system now can be made mechanically redundant and ballistically tolerant. Additionally, the tactical aircraft guidance system (TAGS) demonstrated a fly-by-wire flight control system (FCS) for application to larger helicopters which provided triple redundancy and demonstrated the technical feasibility of eliminating long, large and heavy mechanical linkages in big helicopters, as has been proven by the recent heavy lift helicopter concept.

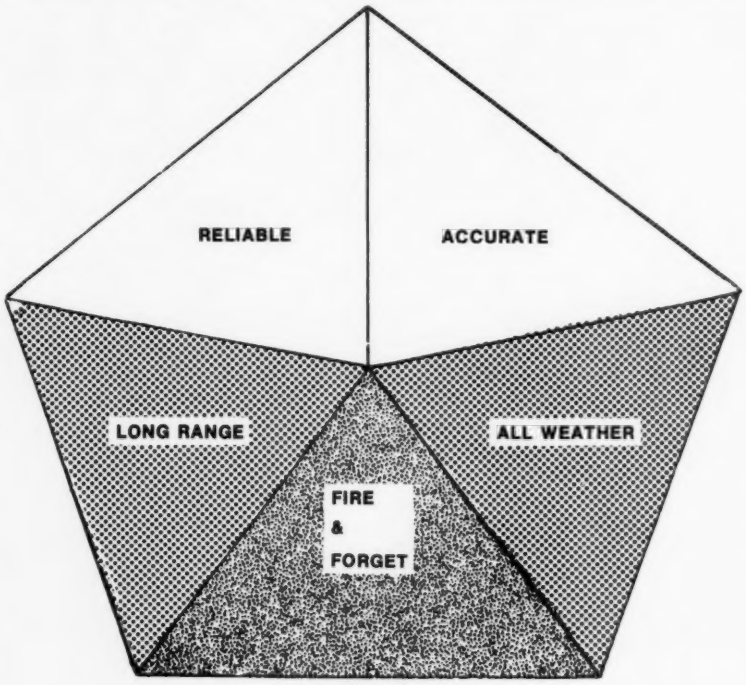


Figure 3

Weapons

Another innovative concept was a study designed around total encapsulation of crew and critical components within protective armor. The armored aerial reconnaissance system (AARS), as it came to be known, utilized a completely armored fuselage which acted as a primary structure and a

massive counterrotating rotor system, inherently ballistically tolerant, which contained the control tubes concealed within its rotor mast. With respect to protective technology a vast research and development effort has expanded the technological base from which new systems can draw survivability concepts for application in helicopter design.

To this point the emphasis has been principally passive protection. Now let us turn to active means for defeating enemy threats or active electronic countermeasures and tactics, the second and third elements of the survivability triangle in figure 1. The primary consideration here is upon weapons and the tactics used to maximize the effectiveness of weapons employed against a heavily mechanized enemy threat.

Figure 3 depicts five desirable characteristics that weapons systems should have with respect to operations, with all five receiving emphasis within a variety of programs. Reliability will not be addressed specifically, as each project provides for the individual assessment of this characteristic.

Tests of the extended range TOW (tube-launched, optically-tracked, wire-guided) missile conducted in June 1973 are indicative of the constant effort in striving to reach the enemy at the longer ranges in excess of 3,500 meters. The disadvantages of the TOW missile which require aircraft system exposure during the flight of the missile are being overcome with the development of terminal homing weapons or fire-and-forget systems such as the Helicopter Fire-and-Forget (HELLFIRE) missile. Also under test for application to turret-mounted helicopters is the 30 mm gun system, to be coupled with ranging and sighting devices to ensure first-round hit capability.

In 1971, AH-1G HueyCobras were tested in Germany to determine the adequacy of low light level TV as part of a Cobra night fire control system (CONFICS). Because of the inherent advantages of this unique capability, work is now under way to dramatically improve night vision systems in the far infrared part of the spectrum in the hopes of achieving a range in excess of 2,000 meters in 1976, with longer ranges obtainable in the 1980s. Further, new and improved optical sighting mechanisms employed with various weapon systems have been upgraded substantially with the addition of laser rangefinders which can be fitted with passive IR for night employment. This technique is a short step from providing a laser seeker mode that could be coupled to a standard optical tracker which would enable a ground-based laser target designator to guide air launched missiles to targets. These advances in weapons, target acquisition and weapons delivery systems undoubtedly will have substantial payoffs in future combat survivability.

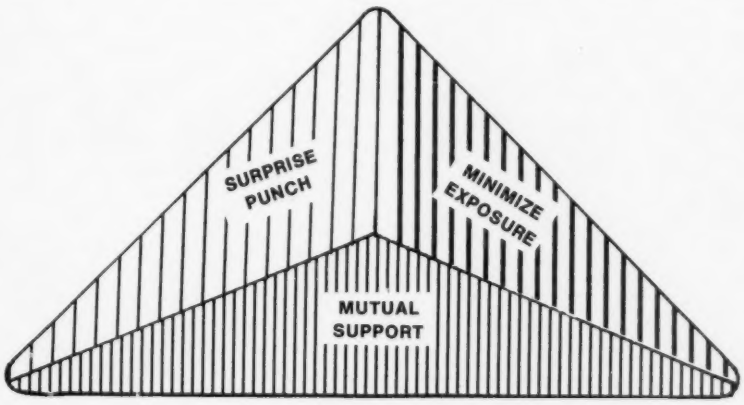


Figure 4

Tactics

Many agencies are involved in the testing of new products, tactics and weapons systems in an attempt to assure that the three elements contained within the tactics triangle in figure 4 are achieved on a future battlefield. The U.S. Army Combat Developments Experimentation Command (CDEC), Fort Ord, CA, has tested a variety of helicopter night operational techniques aimed at enhancing the effectiveness of the helicopter on the battlefield. The Modern Army Selected Systems Test, Evaluation and Review (MASSTER) activity at Fort Hood, TX, has established itself as a leading integrator of state-of-the-art survivability concepts with current fleet helicopters and is a prime requirements generating agency. In field testing of products which incorporate prototypes of candidate systems, these organizations frequently have identified concepts that merit further study and development effort as well as those that should be discarded.

The following programs are typical of the types of testing accomplished. CDEC has conducted experiments that have demonstrated that qualified pilots can function at night in limited night low level operations. The Combat Air Vehicle Navigation and Vision Study (CAVNAV) evaluated the use of night vision devices in the terrain flying environment for Army helicopters. The MASSTER test of a

surveillance, target acquisition and reconnaissance (STAR) platoon which incorporated a variety of candidate night-oriented systems is typical of the unit level testing that can and has been accomplished. This test unit contained a variety of night systems, including an active radar countermeasures system, and tested both tactics/employment as well as the systems themselves. The testing of more advanced systems/tactics will undoubtedly continue if the Army is to meet and counter both existing and future enemy threats while enhancing its combat effectiveness.

The AH-56 Cheyenne helicopter, an original prototype of an advanced attack helicopter, received criticism from many quarters; one reason advanced for its eventual demise was a lack of survivability features. As a result survivability has become a key consideration in all current Army helicopter developments.

As a typical example the AAH will combine structural redundancy, noise suppression, twin-engine propulsion, accurate long-range guns, and missiles matched with suitable "visionics" devices that, together with high maneuver capability, should enhance survivability on the battlefield. The major design criterion of the AAH was to permit maximum survivability against the anticipated air defense threat. In keeping with this criterion one competitive prototype AAH will incorporate a rotor concept featuring a strap retention system with blades of laminated stainless steel straps providing redundant load paths.

A second competitive prototype concept will employ blades with a multispar construction where one spar can be severed without a catastrophic failure. Further, one model will have a tail rotor gearbox capable of withstanding a 12.7 mm direct projectile hit and a dual rotor drive shaft for redundancy. Both models will meet stringent maneuverability and one-engine-out performance requirements.

The ultimate AAH is likely to incorporate active and passive infrared countermeasures (IRCM) to counter the heat-seeking missile as well as passive electronic countermeasures (ECM) against radar directed antiaircraft weapons. Furthermore, canopy reflection from sun glint and possibly radar are to be minimized by the use of flat plate surfaces, while nonreflective and camouflage paints will be used on the fuselage. Armor and self-sealing tanks will protect critical components/crew and fuel, respectively. As is evident from these highlights, extensive research to date has been applied to the maximum, within cost constraints, to ensure the survivability of the AAH.

The UTTAS is also a twin-engine vehicle. Engine vulnerability was a major consideration in engine selection, though not overriding, and the final engine selected was an improvement in survivability design over many of its competitors (including ballistic and environmental tolerance). Both competitive UTTAS prototypes incorporate significant survivability design considerations, including passive IRCM, ballistically tolerant/redundant flight controls, and highly survivable tail rotors and transmissions that can accept ballistic impacts and penetrations up to and including 12.7 mm projectiles. Additionally the structures of both aircraft will provide for redundant load paths and will include low silhouettes for minimum radar cross section. It is the intent that since both competing prototype systems are compatible with the AAH, the ultimate UTTAS will provide the desired mutual support in all future air-mobile operations.

The CH-47 Chinook modernization program is an effort presently limited to product improvements that will incorporate limited advancements in survivability. The primary improvements involve ballistically tolerant fuel tanks, fuel lines and self-sealing hydraulic lines. To supplement these limited improvements a special aircraft survivability equipment (ASE) program is underway to significantly reduce the vulnerability of the CH-47 as well as the entire fleet of current Army aircraft. This program will involve extensive survivability design features in many areas, including radar reflectivity reduction, threat warning, IR, optical and vulnerability reduction, and the concepts generated will be capable of being retrofitted on the existing aircraft fleet or incorporated into new aircraft development programs. ASE essentially then will increase the Army's combat effectiveness by reducing or eliminating the enemy's ability to detect, hit, damage or destroy Army aircraft on the modern battlefield; will increase the useful combat life of the current fleet aircraft; and will provide an advanced level of combat survivability for the development fleet.

It is impossible in one article to cover every aspect of such an expanding field as survivability. The important factor to remember is that survivability features are available and effective. Considering the present as well as anticipated threat, Army aviation unit commanders, pilots, safety officers and maintenance personnel must continue to be oriented toward survivability and must maintain the tradition of providing the required vertical lift support for future military operations. In keeping with this tradition it is vital that aviation personnel in the field appreciate and understand where, in the overall plan, various research and development efforts lie within the matrix of programs designed to ensure mission accomplishment with a balance of risk and survivability design features.

Continued from page 8

the number of hours an Aviator can fly without being fatigued? AR 95-1 would be the size of the New York City telephone directory and require two statisticians per operations section to interpret it.

Simplify the problem by selecting only six of the variables to scientifically analyze. Which six? How many different combinations could you come up with? Thirty-six things considered six at a time calculates to 1,947,792. Almost two million combinations! Not so simple after all!

By now even the most "scientifically" inclined commander might be discouraged. The light should start dawning that we are on the wrong track. The right way to make this diagnosis is for the commander and staff, especially the operations officer and safety officer to suspect it in the first place and then use good common sense and, if lucky enough to have one, use the flight surgeon to keep an eye on the Aviators.

Variables Contributing to Fatigue

Altitude inducing varying amounts of hypoxia, cold, hyperventilation and dysbarism
Velocity and proximity of terrain
Ambient temperature
Protective equipment, from Nomex to chicken vests
Accelerations of maneuver, from grey-out to nausea
Vibrations from teeth rattling to visual interference
Instrument ease of reading, from red light to triple dials
Equipment location and reliability
Visibility, involving reflection and field of view
Seating, from plush to hard board ejection
Lighting, both daytime and night, inside and out
Noise levels
Aircraft type, from T-42 Cochise to AH-1 Cobra
Weather
Work/rest cycles
Meals and accommodations
Responsibility, from Peter Pilot to instructor pilot to commander
Experience, from exhausted novice to relaxed Master Army Aviator; total, recent
Organization of ground support, from good to awful
Leadership, from inspirational to nonexistent
Maintenance, from reliable to scary
Psychological influence of a known high accident rate
Frustration due to reduction in force or promotion problems
Lack of confidence, varying from nervous to scared stiff
Family problems, from in-laws to borrowing cousins
Administration, from pay errors to duty roster errors
Illnesses, from needing new glasses to getting an ulcer
Diet, from too much to too little
Age
Recreation, from volleyball to "extra-hot" dates
Booze, from under the influence to hung over
PT programs, from none at all to airborne ranger
Smoking, from none to 15 percent carboxyhemoglobin
Drugs, from aspirin and Gelusil to marijuana
Moonlighting, from none to an extra 60 hours per week
Commuter distance, from living on post to an 8-hour drive (interstate fatigue syndrome)
Social obligations, from none to the "cocktail circuit"

Periodically the argument is resurrected that our sister services have defined crewrest periods and crewwork periods for each day. Other services have different missions.

It surprises me that anyone would want a regulation to further hamstring commanders and not let them use their judgment instead of another confining set of rules. After reading this article take the time to read those few paragraphs in AR 95-1 again. They are beautiful. Have the good sense to follow that guidance. If you are determined to have a new regulation why not write one that prohibits accidents? If would make about as much sense.

New Horizons REVISITED

With the establishment of "camera-ready" capability at the U. S. Army Aviation Center, the design of the publications is improved and the preparation time is greatly reduced

Major Clifford Thomas
Chief
Training Literature Division
Directorate Of Training Developments
U. S. Army Aviation Center
Ft. Rucker, AL

IN THE SEPTEMBER 1975 issue of the *AVIATION DIGEST*, "New Horizons" was published to acquaint the aviation community with the Army's publications being developed to support new doctrine and equipment.

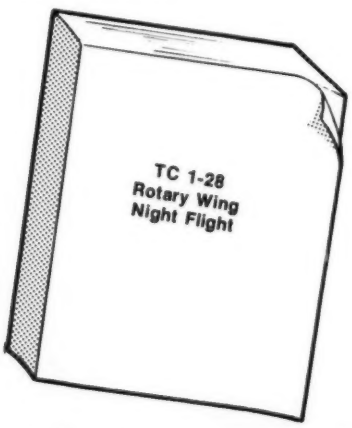
The bicentennial year of 1976 has taken us beyond this original plateau and the time is ripe to revisit New Horizons to see where we are 1 year later.

This year a major event took

place in training literature with the establishment of a "camera-ready" capability at the U.S. Army Aviation Center, Ft. Rucker, AL. This capability at installation level allows subject matter experts, writers, artists and visual information specialists to work side by side during the development of a publication. Through the use of equipment similar to that used in the publication of newspapers and magazines, the book is developed completely at the Aviation Center. It then is forwarded through appropriate channels for mass printing and distribution.

This new capability gives the Aviation Center two major advantages:

- It reduces time required to get the book to the field for use. The target time for dispatch of a prepared publication in camera-ready format to field units is about 90 days.



- There is a vast improvement in design. The use of color and meaningful illustrations is a major factor in increasing the usability of publications.

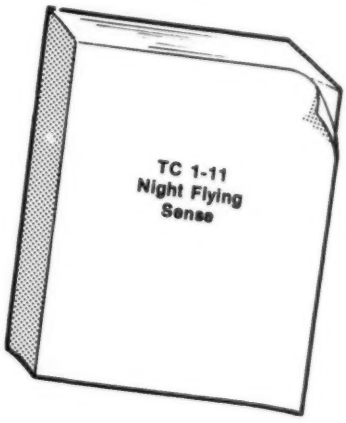
Several new publications under development deserve a short discussion.

The first group of publications you will receive is the "preparation" series. These books are required because of the need to train at night, both with the aided and unaided eye. Each of these publications is hardware oriented and designed to complement the cornerstone of night flying—TC 1-28, "Rotary Wing Night Flight"—and to aid units in conducting realistic training in accordance with both FM 90-1,

"Employment of Army Aviation Units in a High Threat Environment" and FM 1-1, "Terrain Flying." Two of the series, TC 1-29, "Preparation of the UH-1 for Night Flight" and TC 1-30, "Preparation of the AH-1 for Night Flight," are available for field use. TCs 1-31 (OH-58), 1-32 (CH-47) and 1-33 (OH-6) will be available for distribution to the field by the spring of 1977.

A second group of publications is the "sense" series. This group is basically a resurrection of the "sense" pamphlets of the sixties. You "old, bold" Aviators have read these many times while you were in ready rooms or sitting on a tire waiting for your passenger to return. The subjects contained will be expanded and current doctrine and philosophy applied. The publications will be relatively short, highly illustrated and have important messages and "flying tales" to tell. They will be TC 1-10, "Mountain Flying Sense"; TC 1-11, "Night Flying Sense"; TC 1-12, "Cold Weather Flying Sense"; and TC 1-13, "Hot Weather Flying Sense." The first of the series, TC 1-10, will be available in the spring of 1977.

The third group under development is the "standardization" series. This group is a direct outgrowth of the need for worldwide standardization of aircraft operation and procedures. The "father" of this series is TC 1-34, "Qualification in Army Aircraft." Although now on the streets, it will be republished—incorporating the latest changes required by the ARs and addressing the newer model aircraft joining the inventory. The next 12 books, TC 1-35 through TC 1-46, will relate to standardization in the active inventory aircraft. The first of the series, TC 1-35, "Qualification Training and Standardization (UH-1)," is available. TC 1-36, "Qualification Training and Standardization (OH-58)"

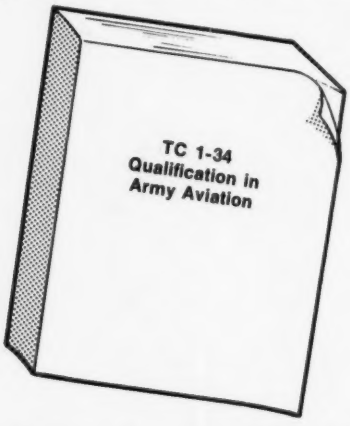


and TC 1-39, "Qualification Training and Standardization (CH-47)" will be on the streets by about 1 April 1977. The remaining publications are to be fielded in the near future.

Now that the "groups" are covered, let's discuss some "individual" affairs. TC 1-88, "Aviation Recognition Manual," is a book born of necessity. It grew by hard work and loving care. TC 1-88 will be a ready reference which can

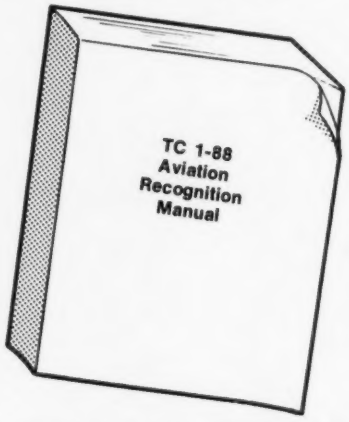
be used by the Aviator, aerial observer and others to assist in the recognition and identification of equipment that may be found on and in the vicinity of the forward edge of the battle area. This will include friendly, Allied and potential enemies. The peculiarity of this book is that it addresses all types of equipment that can be seen and identified from the air and that possesses a threat to the over-flying aircraft. This publication also will be available in the spring of 1977.

Another new publication due next spring is FM 1-15, "Aviation Reference Data." This is a composite book of FM 1-15, "Aviation

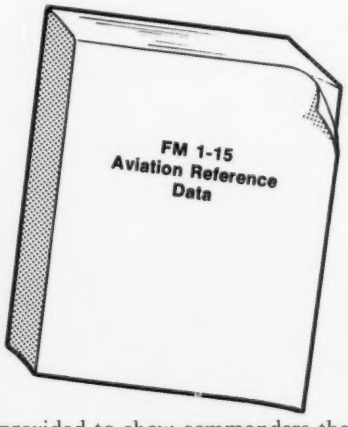


Company, Battalion and Brigade" and ST 1-100-1, "Aviation Reference Data." The best of both publications were coupled together and the data completely updated to show the current organization, mission and functions of each unit. The book will be in two volumes. The first will contain data that will remain relatively constant while the second volume will contain more volatile data. This publication will prove invaluable to the aviation planner.

FM 90-1, "Employment of Army Aviation Units in a High Threat Environment," the capstone manual in the U.S. Army Training and Doctrine Command's "How to Fight" series for Army aviation units, became available last month. It is designed to provide a broad doctrinal foundation for future publications which will be specifically oriented toward employment of



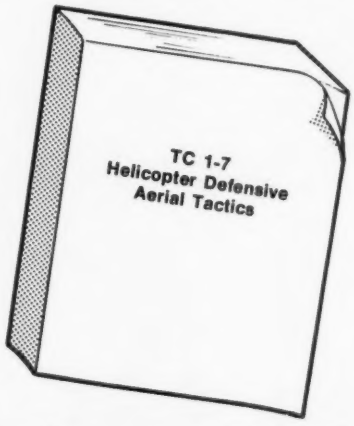
type aviation units. Through the means of short tactical vignettes and various battlefield scenarios, FM 90-1 provides the commander specific examples of how to employ type aviation units. Combined arms employment is stressed throughout. Total integration of the ground and aerial capabilities is



provided to show commanders the wide variety of tactical alternatives.

Some new publications coming down the pike are FM 1-2, "Aircraft Battlefield Countermeasures and Survivability"; TC 1-3, "Army Aviation Unit Operations in a Nuclear, Biological, and Chemical Warfare Environment"; and TC 1-7, "Helicopter Defensive Aerial Tactics." These publications are completely new, dealing with difficult and to a limited degree, untested subjects. Anticipate these at your local pinpoint distribution center in late fiscal year 77 or early fiscal year 78.

Well, we have revisited New Horizons. The items here are just as dynamic and progressive with doctrinal thoughts and training requirements as the books discussed last time. The authors of these publications want to support you in the field. Drop us a line or give us a call—let us know your problems and needs. Certainly we will res-



pond to our utmost. Our address:

Commander
U.S. Army Aviation Center
ATTN: ATZQ-TD-TL
Ft. Rucker, AL 36362
AUTOVON 558-7120/2482

The ball is rolling—gathering speed every day. A new technique, a new piece of equipment, a better way to train—these items must be addressed and we are doing this by using the proven method of the written (and illustrated) word. With the emergence of sophisticated equipment in conjunction with a well equipped and trained potential enemy, the training mission becomes more difficult. With a professional attitude by professionals, we *can train* and *win the big battle.*

VIEWS FROM READERS

The *DIGEST's* July 1975 cover (see photo) served to generate the following comments. For those to whom this applies — pass the word that power tools are *not* to be used in repair of compressor blades. Editor

Sir:

The cover photograph on the *AVIATION DIGEST*, July 1975, was a striking picture indeed. One month before, June 1975, this unit had a slight disagreement with our support on just how compressor blades were to be repaired.

A DA Form 2028 was submitted by this unit requesting a special note pertaining to the non-use of power tools to prevent any misinterpretation or not reading far enough into paragraphs. This was done as backup after a telephonic inquiry and reply at the time of the incident . . . .

Approximately 2 months after this incident we received the July issue of *AVIATION DIGEST*. When I glance thru back issues of the *DIGEST* this picture keeps coming out larger than it is and I decided to write this letter. I think that pictures, cover or otherwise, unless titled should not be used. The incident with our support is a good example. If one of our crewchiefs had not been with the aircraft no one would have been aware of the mistake and this photo could have reinforced the belief that power tools can be used throughout the engine.

I would like our unit designation left out of any further use of this letter. A day's smile between using units and support is worth more than a minute's grumble or growning.

The following information was provided by the Director of Maintenance, AVSCOM.

It is recommended that the July 1975 *AVIATION DIGEST* picture not be used in the future to depict maintenance on the T-53 engine. TM55-2840-229-24, chapter 7, forbids the use of power tools when removing defects in compressor blades; the subject photo has led to some misunderstanding in this area.

The sergeant first class should be informed that the answer to the DA Form 2028 dated 12 June 1975 is still valid. The TM and chapter cited above have explicit instructions saying that *power tools are not to be used in the repair of compressor blades.* These instruction remain in effect.

Sir:

The oldest Skycrane company in the U. S. Army recently celebrated its organization day with a picnic and honor ceremony. Guest of honor was MSG (Ret) Jim Isom, the unit's initial first sergeant when it was organized as the 478th Flying Crane Company 13 years ago.

VIEWS FROM READERS

The 478th Aviation Company (Heavy Helicopter), 34th Medical Battalion, Ft. Benning, GA, began its life as a Quartermaster Truck Company in 1944 and was changed to a Transportation Corps Truck Company in 1946. In 1963 the Army procured a CH-54 Skycrane helicopter and the 478th was redesignated as the 478th Flying Crane Company to provide the test unit.

The concept was thoroughly tested and proven as part of the 11th Air Assault Division, including a world record lift of 86 combat-equipped troops and 4 crewmen at Ft. Bragg, NC, in October 1964. The 478th then became a part of the 1st Air Cavalry Division and its name was changed to the present designation.

It served in the Republic of Vietnam from August 1965 to October 1972 when it stood down and returned its aircraft to CONUS. The unit colors were returned to Ft. Benning where the unit was reactivated in November 1972. Among its awards and decorations, the unit received the Vietnamese Cross of Gallantry with Palm and the Vietnamese Civil Action Honor Medal, 1st Class.

CW4 BILL C. WALTON
Public Affairs Officer
478th Aviation Company (HH)
Ft. Benning, GA

The 295th's CH-54 Skycranes In Europe

IN THE SPRING of 1967, at Henry Post Field, Ft. Sill, OK, the 295th Aviation Company (Heavy Helicopter) began a most impressive era in the history of Army aviation. It was to be an era of the CH-54 Skycrane and the people associated with them.

Activated in April of that year, the company started its building in personnel, equipment and the new CH-54. Its first mission was to organize and train CH-54 elements deploying to the Republic of Vietnam. Interestingly, the first award won by this fine aviation unit was the Award for Outstanding Marching Unit of the Artillery Aviation Command. Its first permanent commander was Major Vernon L. Sawvell.

Support and training for CH-54 platoons deploying to Vietnam continued into 1968, with Major Ronald A. Jones commanding. This fledgling company also was now providing support to the Artillery and Missile School and conducting its own CH-54 aircraft transition course. The unit also was called upon to perform other missions within the United States, challenging them still further. Towards the end of the year the unit was notified it, too, was to be deployed. To top the year off, two CH-54s and their crews were sent to Europe for participation in Reforger I.

Vigorous unit training for deployment became the mandate in January 1969, with emphasis on quality maintenance training. While still providing helicopters and crews throughout the United States, the 295th Aviation Company achieved outstanding ratings on FTX and the ATT. Deployment came in May to Finthen Army Airfield, Germany, under the command of Major James E. Rogers.

The 295th had joined the 15th Aviation Group (now the 11th Aviation Group). With much of Finthen AAF facilities still under construction, field maintenance had to be set up to support the helicopters. The first assigned mission came quickly, calling for flight demonstrations for the services, VIPs, and the German press in order to acquaint them with USAREUR's newest capability. Local area orientation for all Aviators was completed by 15 June and the company was mission ready.

Throughout Europe missions began to develop calling for aircraft recoveries, precision placement of bridge sections, movement of heavy equipment, troop hauls and airshows. Letter after letter was received at the company attesting to its outstanding service, professionalism and international goodwill. General James H. Polk, commanding general of USAREUR, visited the 295th and praised them for their progress since their arrival in Germany. After only 4½ months in Germany, the company had successfully passed its AGI, while still maintaining a high aircraft availability. The 295th Aviation Company had set a new pace for USAREUR aviation units.

The pace has continued through the years. The 295th routinely fulfilled the mission of providing airlift for troops and heavy equipment. The diverse and professionally demanding missions became the order of the day. With their faithful Skycrane, they built dikes in the Netherlands, set large air-conditioning units on top of tall buildings, sling-loaded fighter aircraft in Spain, recovered crash-damaged aircraft of many types throughout Europe, moved Sno-Cat plows to mountaintops, set towers in place to build ski lifts, mounted large TV antennas to provide television service to U.S. Forces in Germany, and also were used as an airborne fire fighting vehicle dumping thousands of gallons of water to extinguish forest fires.

The unit also contributed immeasurably to better relations with their German neighbors. A unique idea was nurtured and developed wherein each of the Skycranes was formally christened and named after selected cities throughout Germany. Recognition of these events still continues with the exchange of greetings with the Lord Mayors during the Christmas season.

These accomplishments have resulted in the selection of the 295th Aviation Company and/or its supporting 326th Transportation Detachment for the coveted honor of USAREUR Aviation Unit of the Year in 1969, 1971, 1972 and again in 1974. They are justifiably proud of these achievements.

Recently, the thrust has been directed toward survivability in a mid-intensity environment. To this end, the unit has been developing their skills in terrain flying techniques, low level both day and night. As a result, aircrews are prepared to meet the challenge of tomorrow.

Flying safety is always of foremost concern in any aviation unit and the 295th has a very enviable flying safety record. Since its activation in August 1967, it has only experienced one aircraft accident and that was in July 1970. The company has since flown nearly 12,000 accident-free hours and in July 1976 the company qualified for the new "Department of the Army Aviation Accident Prevention Award of Excellence" for achieving 72 months of accident-free flying.

What have been the major contributing factors to the success of the 295th? One has been a love affair developed in the beginning between the people and the Skycranes. Maintainability and reliability have helped this unit to consistently provide outstanding service to support units. Second, the unique characteristics of the CH-54 have provided many unusual and professionally demanding missions that would otherwise have to be accomplished by other means. Finally, and most important, has been the attitude of the personnel. They live for the challenge of tomorrow. They are convinced that any mission can and will be accomplished. "Can-do" is their byword. Moreover, they will do it professionally, safely and better.

CH-54 "Skycranes" silhouetted against the Oklahoma sky. At the time, the helicopters were assigned to Fort Sill

Starker Memorial

THE 6TH CAVALRY Brigade (Air Combat) has dedicated its new modular gymnasium in honor of the late Brigadier General Joseph B. Starker. The dedication honored the former 1st Cavalry Division assistant division commander, one of the great pioneers of modern day aviation, with the unveiling of a memorialization plaque and portrait of the late general.

More than 300 6th Cavalry Aviators, Ft. Hood commanders and special guests attended the dedication for General Starker, who was killed in an automobile accident in San Antonio, TX, in July 1975.

Lieutenant General Robert M. Shoemaker, III Corps and Ft. Hood commander, described General Starker as a professional Solider "in every sense" who laid the foundation for the air cavalry combat brigade concepts which became a reality through the activation of the 6th Cavalry.

"He was a mover," General Shoemaker said, "a doer. Joe got involved and he was intensely loyal. . .this is why this gymnasium is so fitting. I know Joe would be happy to know this building with his name was being used for the purpose of developing physically fit Soldiers who are carrying on this very important work that he pioneered."

The Starker gymnasium is located in building 87010 in the 6th Cavalry Brigade modular complex. Included in the 21,956-square foot building are a gymnasium floor large enough for basketball and volleyball to be played simultaneously, badminton courts and one squash court.

Dear *AVIATION DIGEST* Reader:

I have been telling everyone I can about my recent trip to visit Army aviation units in the Orient. That is why I'm writing this letter to you through the Views From Readers column of the *AVIATION DIGEST*.

Have you ever heard the slogan, "Red Carpet Service for Honshu"? That's the motto of the U. S. Army, Japan (USARJ) Aviation Detachment at Rankin Army Airfield, Camp Zama, Japan. The motto is appropriate for this detachment which, although not large, performs two most important, time critical missions.

If you have never been to the Tokyo/Canto Plains area, it's hard to realize how invaluable the helicopter is there in its transportation role. For example, it takes more than an hour to drive a car 8 to 10 kilometers. You can bet that the detachment's eight UH-1 Hueys are providing "red carpet service" to both USARJ's—and IX Corps' requirements to coordinate U.S. Army activities in Japan. The detachment contributes immeasurably to maintaining strong U.S.-Japanese ties. A good example is that two of the detachment's aircraft are dedicated to the medical evacuation role. This translates into an overseas military assistance to safety and traffic (MAST) mission in many regards.

It was about 15 years ago that I was in the Tokyo/Canto area. I thought it was heavily industrialized and populated then. But now the area is engulfed with visibility restrictions associated with huge industrial complexes and the population is so concentrated that any autorotation would have to be to someone's roof. Has anyone been trained for such an autorotation?

LTC Jessie James is doing an outstanding job commanding the USARJ flight detachment. My compliments to all in the detachment for an excellent job supporting LTG John R. Guthrie and his most demanding job as commander of the U.S. Army in Japan. And, how about the detachment's proud accomplishment of no accidents in 5 years!

In Korea things are booming. Would you believe driving at 70 miles per hour on a beautiful interstate highway from Seoul to Pusan? Or how about flying Korea Air Lines in either a Boeing 747, DC-10 or A300B Air Bus with some of the finest service in the world. Such extraordinary accomplishments in Korea spring from the rapid growth of Korea's gross national product.

I did not have time to visit all of the units in Korea. But I did spend time with the 17th Aviation Group and the 2nd Infantry Division, which has the 2nd Aviation Battalion and D Troop, 4th Squadron, 7th Cavalry. At Camp Stanley I had a most enjoyable visit with MAJ William D. Collar and the members of his 117th Assault Helicopter Company. They have set up, and conduct a fine training program. They recognize that in the event of hostilities limited U.S. Forces in Korea dictate that most Army Aviator missions would be in support of the Army of the Republic of Korea. All of the commanders I talked to have stepped up training for this mission.

There is interesting news to report from the 2nd Division which is converting its armored cavalry squadron to an air cavalry squadron. When this is done — and it's scheduled for completion in the fourth

Continued on page 28

Optical C
-A Look At T

Steve K
Public Inform
Harry Diamond
Adelph

ALMOST A DECADE has passed since the first laser successfully was demonstrated as a new dimension for Army tacticians. With its inherently high countermeasure (CM) resistance and extremely high range and azimuth resolution, optical sensing was seen as a solution to many Army requirements.

The U. S. Army's Harry Diamond Laboratories (HDL) at Adelphi, MD, has applied this laser technology to a host of sensors, techniques and systems for eventual use by today's modern Army.

Coordinated with elements of the U. S. Army Materiel Development and Readiness Command, these research and development (R&D) projects have resulted in a portable laser signalling beacon; an intervisibility beacon for determining when an optical line of sight (LOS) exists between two moving vehicles; an engagement simulator; a slant range fuze; and most recently a tunable infrared (IR) laser. To accomplish such a wide range of laser developments, HDL conducts a physics research program that today is investigating integrated optics, atmospheric effects on optical beams and subminiature optical sensors.

In recent years, HDL's laser-related program has exceeded $1 million per year with a fiscal year 77 estimate of $1.5 million. As a result of these end item oriented projects, the modern Soldier soon may be afforded an improved optical capability on many major weapons systems.

Historically, HDL's expertise began in the mid-60s with a diverse research program aimed at a better understanding of solid-state and gas lasers, short range laser rangefinders and atmospheric effects. By the early 70s a small, portable, battery-powered Helium-Neon laser, known as a visible laser beacon, was conceived as a laser signalling device for emergency and military uses. Complete with batteries, the device weighed about 2 pounds and was shaped much like a commercial flashlight. In good weather conditions the compact beacon could be seen over a 1,000-square mile area by a search aircraft flying at 30,000 feet.

By 1973 HDL had designed a prototype intervisibility beacon system. The system was developed to provide the U. S. Army's Combat Developments Experimentation Command (CDEC) with a means of obtaining data on the time during which an LOS exists between two opposing tactical units in a battlefield simulation. The collection of such data was necessary to

Known as a visible laser beacon, this portable, battery powered helium-neon laser was conceived as a laser signalling device for emergency and military uses

refinement in last
impact army av
vanced, sophisti

Exposure
The Horizon

ve Kimmel
nformation Officer
amond Laboratories
delphi, MD

evaluate factors which influence weapon system performance during target acquisition and to assess the number and frequency of engagement opportunities which may exist on the battlefield. In the past CDEC has relied on separate side experiments to obtain information on the distribution of LOS and the degree of exposure between two opposing forces. This had been time consuming, costly and often resulted in incomplete information to fully evaluate experimental results.

The HDL concept automatically indicated in realtime whether an optical LOS existed between two players in field experiments. The eye-safe system was designed to be installed on air and ground mobile vehicles.

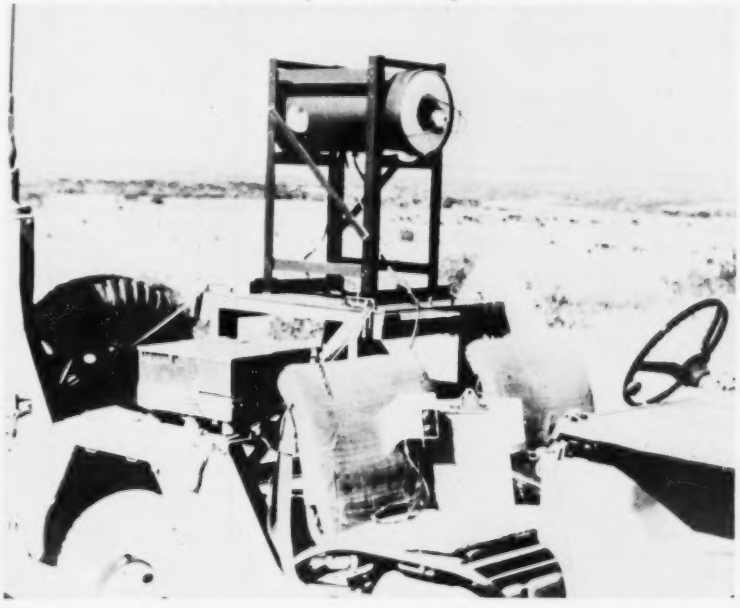
Currently, HDL is developing a laser terminal homing engagement simulator (LATHES) for the U. S. Army Operational Test and Evaluation Agency. It is designed for test and training exercises involving laser terminal homing systems such as the copperhead, formerly the cannon-launched guided projectile (CLGP); helicopter launched fire and forget (HELLFIRE) missile system; lightweight laser designator (LWLD); ground laser locator designator (GLLD); airborne target acquisition and fire control system (ATAFCS); and airborne laser tracker (ALT).

The most important feature of LATHES is that it allows field simulation of a tactical laser terminal homing engagement without using any components that pose a hazard to the eyes of user or bystander personnel. LATHES components are eye-safe at zero range.

The basic concept of the LATHES system is to provide eye-safe equipment capable of realistically simulating the tactical characteristics of a laser terminal homing engagement. As such the LATHES system allows test or training of tactical proficiency (command and control, tactical fire control, selection and utilization of tactical position, etc.) as opposed to technical proficiency (operator tracking capability, operation of the GLLD controls for ranging, etc.).

The LATHES system consists of three major subsystems—the designator simulator, the target pallet and the receiver. Together the LATHES hardware is designed to allow the simulation of the elements of the engagement that involve active interactions between the designator, target and seeker (from initiation of designation to

The Laser Terminal Homing Engagement Simulator (LATHES) target pallet mounted on an Army jeep. It includes an eye-safe laser target simulator



aser technology will aviation with ad-sticated weaponry

An eye-safe LATHES in use at Ft. Hood, TX, during Phase II of the Joint Services Test of Laser Guided Weapons in close air support, April 1975

the end of the engagement). The LATHES designator simulator provides a visible light beam to cue to the target when designation is initiated and to confirm the existence of a clear optical LOS from the designator to the target. The LATHES target simulator, turned on upon the cue provided by the designator simulator, generates a coded laser target signature fully compatible with tactical seekers and search/track systems. In addition the LATHES receiver provides a low-cost simulation of a seeker or search/track system with full DOD standard decoding capability.

Simultaneously, HDL is investigating a broad range of techniques for hardening laser terminal homing systems against countermeasures.

This is in support of the Precision Laser Designator Product Office and the HELLFIRE Missile System and Cannon Artillery Weapons Systems (CAWS) Project Office. These investigations range from studies of potential CM and counter-countermeasures (CCM) all the way to the design and fabrication of CCM hardware and its use in operational field tests. Specific CCM activities include digital signal processing of coded laser signals; passive optical CCM techniques to protect the laser target-designator; active optical CCM devices; and participation in the planning and execution of CM/CCM field tests.

In another area HDL is adapting laser optics to the fuzing of weapons. As the battlefield of tomorrow becomes more sophisticated, Army Aviators may need to activate flechette munitions at precise ranges from the enemy.

A little more than a year ago, the U. S. Army Aviation Test Board [now designated the U. S. Army Aircraft Development Test Activity], Ft. Rucker, AL, conducted its first functional test of a slant range optical fuze.

The HDL design was developed to be compatible with the Army's selected effects armaments subsystem on the 2.75 inch rocket and uses a 30-watt gallium arsenide (GaAs) injection laser. The fuze is basically a narrow beam optical radar whose semiconductor laser radiates a pulsed narrow beam which is reflected from the target. The receiver, as well as the laser, is located in the fuze; thus when the fuze determines that it is at the

desired distance away from the target, the warhead is initiated.

Also announced within the past year was the success of one of HDL's in-house sponsored physics research projects that resulted in the first spin-flip Raman laser using mercury cadmium telluride material. For their efforts, three physicists received the U. S. Army Research and Development Achievement Award for 1975.

Potential applications for this wavelength tunable laser are:

- as a local oscillator for IR heterodyne receivers
- as a high-brightness, high-resolution source for determining the laser transmission properties of the atmosphere
- for secure short-range communication links
- for isotope separation

This new tunable laser development will provide the basis for even further improvements in military laser systems.

Currently, HDL is attempting to reexamine the use of low-powered laser transmitters and IR receivers as a substitute, and also as an adjunct, for shooting live ammunition for both rifle and tank training courses.

Other efforts include a subminiature optical sensor for use on an oriented submunition round. The goal of this project is to reduce the sensor's cost to less than $2 and occupy a space less than 1 cubic inch. If achieved, the sensor will permit a new family of oriented submunitions with an improved lethiality over current submunitions, especially over rough terrain or vegetation.

The significance of these R&D projects are but a sampling of the horizon for Army optical systems. As the experience and knowledge of laser technology becomes refined, it is the modern Army that will benefit with improved sophisticated weaponry and tactics.

The optical slant range fuze functioning was first tested by the U. S. Army Aircraft Development Test Activity, Ft. Rucker, AL, more than a year ago

SELECTED EFFECTS ARMAMENT SUBSYSTEM
(OPTICAL SLANT RANGE FUZE)
(SEAS)
SYSTEMS SEQUENCE
① PILOT FIRES - NO FUZE SETTING REQUIRED
② FUZE MEASURES SLANT RANGE TO TARGET
③ FLECHETTE WARHEAD DETONATES AT OPTIMUM STAND OFF
LASER BEAM
U.S. ARMY MISSILE COMMAND

VIEWS FROM READERS

Continued from page 23

quarter 77 — the 2nd Division and 1st U.S. Republic of Korea Group will be able to provide air cavalry support to virtually all of the Korean peninsula. Incidently, this conversion is being accomplished mostly from assets within Korea. I regret that time ran out on me before I was able to visit with those of you in the 2nd Aviation Battalion or the 4/7 Cavalry. But I am sure that we will be hearing great things from you. You can't miss with MG Morris J. Brady as the head Aviator in your division.

At Pyongtaek it didn't take long to learn that LTC Frank Estes and his 19th Aviation Battalion are not wasting any time. The 19th has two CH-47 Chinook companies, an assault helicopter company, an OV-1 Mohawk platoon and is picking up the 145th Army Security Agency (ASA) Company. While at the 19th I flew one of its CH-47s at low level with a sling load through a most realistic and challenging training course.

It's not often that units are commanded by lieutenant colonels. But that's the case with the 284th Aviation Unit (Air Traffic Control). LTC Billie Dooley's 284th has a unique and demanding mission. In Korea, there is no host nation air traffic control or regulation for tactical aircraft. Tower support, flight following and regulation are the responsibility of the 284th and it is doing a firstclass job even though it has severe personnel and equipment shortages. The 284th is officially designated as a battalion level command and rightfully so! Hopefully it soon will be designated a battalion.

"Tropic Lighting" is its nickname; Hawaii is its station; and Army aviation is one of its most important assets. Of course, I'm referring to the 25th Infantry Division which has one of the largest aviation organizations of any regular U. S. division. The 25th's 3rd Squadron, 4th Calvary, commanded by LTC Mike Harvey, is the only active air cavalry squadron rounded out with a National Guard air cavalry troop — E Troop, 19th Cavalry. There also is the 25th Aviation Battalion, commanded by LTC Jerry Childers. The battalion has all of its organic assets plus both the 118th Assault Helicopter Company and the 147th Assault Helicopter Company. While the 25th Infantry has one of the finest duty stations in the world, its training areas are not ideal. But, the division makes maximum use of ranges and training areas on Oahu and Hawaii. Army aviation assets for the 25th are at Wheeler Air Force Base (which should be Wheeler Army Airfield) and Barbers Point.

This report would not be complete without pointing out that COL Paul Smithey and LTC Tony Miklinski have very important Army aviation jobs in Hawaii. COL Smithey is the U. S. Army Support Command Hawaii Staff Aviation Officer. That means he is the "big daddy" for all Army aviation coordination on the island. LTC Miklinski coordinates the activities for the U. S. Army CINCPAC (Commander-in-Chief, Pacific) Support Group, which is the Department of the Army interface for planning with the CINCPAC.

This trip, and others I've made, have surfaced many matters which are discussed under the "bullets" below. But, before I get into them, I want to touch on the matter of the "threat." I am convinced that the overall recognition and appreciation of the threat, and the tactics required to counter it, have vastly improved among our units. They are talking and thinking more and more in terms of training to counter the threat and win that all important first battle of the next war.

• I found a lack of senior grade (CW3 and 4) warrant officers in the really hard aviation jobs. These experienced people are migrating to higher headquarters' flight detachments. I have nothing against these jobs, but we cannot ignore the fact that the attack/air cavalry troops and assault/support helicopter companies require this experience level to be fully combat effective. The Department of the Army is working on this problem now. I think the answer may be to designate and require CW3 and 4 Aviator positions in these designations.

• When Aviators arrive in a theater they are not nap-of-the-earth or instrument qualified. In some cases they are not series or model rated. This is true both overseas and in the Continental United States. Regulations are clear on this matter. *Losing units are responsible for ensuring that Aviators arrive at new units fully qualified.* This is an understandable policy but it is not workable. The policy should be supplemented by requiring the transferring Aviators to go through the U. S. Army Aviation Center at Ft. Rucker, AL, before reporting to their new units. This program is being pursued with the U.S. Army Training and Doctrine Command (TRADOC).

• People are concerned about instrument qualifications (and renewals) just about every place I've been, worldwide. It seems this is especially true in units that have little need to apply their instrument qualifications (such as scouts and attack helicopters). I have found no one questioning the requirement to gain full qualification on instruments during flight school. But a question frequently asked is "why waste 20 hours of blade time (for those stations not equipped with the 2B24 [UH1FS]) maintaining instrument proficiency when that is not part of a unit's mission?" We can solve this problem when we get the proper simulators. I believe we also should be authorizing instrument checkrides in the simulators. The commercial airlines do this, why can't we?

I have been concerned about the manage-

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Sir:

Recent significant events in the 71st Aviation Company and the 295th Aviation Company are related below [and on page 22]. Hope they are of interest to your readers.

CPT Stephen D. Sanford
11th Aviation Group (Combat)
Assistant, S-1

USAREUR Aviation Conference

DURING THE recent United States Army, Europe (USAREUR) Quarterly Aviation Conference hosted by the 11th Aviation Group in Schwaebisch Hall, Germany, the 71st Aviation Company (Assault Helicopter) sponsored a "State of Training" demonstration for Colonel Crawford Buchanan, USAREUR Aviation Officer, and other attendees. The demonstration took place at the Kulsheim Training Area and consisted of a fire fighting demonstration by a CH-54 Crane; a nap-of-the-earth (NOE) demonstration utilizing a UH-1H Huey inserting a tube-launched, optically-tracked, wire-guided (TOW) squad; a static display; and an AH-1Q Cobra performing night NOE and simulated TOW firing.

The demonstration commenced on a wet note as a CH-54 moved into view of the audience and dumped some 1,200 gallons of water to the immediate front of the bleachers. Captain Craig, from the 295th Heavy Helicopter Company, explained that the system was developed to fight range fires in impact areas at military training areas in Germany. The system consists of a CONEX container suspended from the two forward attaching points and the hoist on the Crane. Captain Craig further explained that to empty the bucket the pilot either hovers or flies over the fire and extends the hoist. As the hoist extends the bucket tilts to the rear and allows the water to spill on the fire. A bit of humor was added to the demonstration as the 295th had installed sirens and flashing blue lights, thus converting the CH-54 into a flying fire truck.

The second demonstration consisted of a UH-1H delivering a ground mounted TOW squad. Using NOE tactics CW3 Cormack and 1LT Lowery inserted the TOW squad in front of the bleachers without the spectators being able to observe the flight route. The TOW squad dismounted and moved to a firing position while the Huey moved into a defilade position to await pickup of the squad.

The TOW squad demonstrated its capability by engaging and destroying two tanks. The firing was simulated but success was evident as red smoke was seen billowing up around the "destroyed" tanks.

As the TOW squad was moving back to the pickup point, another CH-54 came into view carrying a palletized FARE (forward area refueling equipment) system consisting of a 100-gallon-per-minute pump, a filter separator, two 500-gallon fuel "blivets" and associated hoses. The guests were invited to inspect the packaged system and another operational FARE system as it was used to hot refuel an AH-1Q and the UH-1 which participated in the NOE demonstration.

An equipment static display was provided consisting of an AH-Q, TOW Cobra, a ground mounted TOW, the FARE, and a UH-1 with its navigation and cockpit lights taped for night flight. By far the AH-1Q received the most attention as the guests were allowed to sit in the gunner's seat and use the TOW sighting unit to track a vehicle located downrange.

The highlight of the demonstration was the night NOE and simulated firing of a TOW missile by CW2 Billows and CW2 Farmer in an AH-1Q. The guests were able to listen to the conversation between the scout ship and the AH-1Q as the scout directed the Cobra into a firing position. Using the night vision goggles and flying blacked out, the AH-1Q was able to engage the target (guests) without being detected. Following the simulated missile launch the OH-58 and AH-1Q conducted a demonstration of night NOE using the night vision goggles. The demonstration was most impressive as visual contact was not made with the aircraft until they were within 30 feet of the bleachers.

The guests were returned to Schwaebisch Hall via the 11th Aviation Group's night low level training course. The course was flown at varying altitudes but remained at least 200 feet above the obstacles along the various legs.

The AH-1Q Cobra Tow. During the USAREUR conference night NOE and simulated missile firing by this model helicopter highlighted the demonstration

ment of the flying hour program for a long time. In Korea I gained some meaningful information. Take a look at a quarterly breakout of the flying hours (below) which I obtained from a crack airmobile company:

Total Quarterly Flying Hours 2,279
Training Missions 39%
Service Missions 61%

The training missions represent readiness. But I have a difficult time supporting the 1,400 hours that went to service missions which might perhaps be better described as "ash and trash." Sure, some service missions contribute to unit readiness but it takes a skillful and imaginative commander to gain this benefit.

We must police our flying hours soon or you can be sure someone else will step in and do it for us. When missions don't contribute to training individuals and the units—don't fly the mission.

BG CHARLES E. CANEDY
Deputy Director of Operations &
Army Aviation Officer
Office of the Deputy Chief of Staff for
Operations & Plans
Washington, DC

Condensed from a paper presented at the 44th Aerospace Medical Association Convention in May 1973

Captain J. A. Pursch, MC, USN
Chief, Alcoholic Rehabilitation Service
Naval Regional Medical Center
Long Beach, California

USAAAVS

ALCOHOL IN AVIATION: A PROBLEM OF ATTITUDES

ALCOHOL IS BOTH the most widely used and abused drug in Western Civilization. Alcohol has become a staple of life, something most of us use daily.

Socially we use it when we feel good, when we feel bad, as a "pick-me-up," to calm down, as an "eye-opener," and as a "night-cap." At cocktail parties we use it to say hello, to "get on step," to "unwind," as an ice-breaker, courage-maker, socializer, or friendshipmaker, and finally as "one for the road." At a dinner party we use it as an appetizer, as a main beverage (beer or wine), as an after-dinner drink, and as "more of the same" during late evening socializing until we drive home with "one for the road" toward the "night cap" before bedtime.

In Naval aviation we drink at happy hours, after a good flight, after a bad flight, and after near mid-air collisions to calm our nerves. To celebrate our first solo flight, we traditionally present our instructor with a bottle of his favorite liquor. We drink when we get our wings, when we get promoted (wetting down party), when we get passed over (to alleviate our depression), at formal dining-in's, change of command ceremonies, chief's

initiations, and free wine at "beef and burgundy night." At birthday balls we drink our door prize if we had the lucky ticket.

Part of the reason for the high incidence of alcoholism must be our drinking customs as a society. In terms of its chemical effect we tend to use alcohol as a stimulant, antidepressant, sedative, analgesic, tranquilizer, aphrodisiac, and soporific (drug or agent which induces sleep).

The National Council on Alcoholism, Inc., considers alcoholism to be the fourth most serious public health problem after heart disease, cancer and mental illness. If alcoholism remains unchecked, the affected person gradually experiences severe deterioration in the ability to work and in physical and mental health.

Although it would seem that nothing is really known about alcoholism, I think that there are perhaps three factual statements that we would all agree on:

- Not everyone who drinks alcohol becomes an alcoholic.
- There has never been an alcoholic who did not drink too much alcohol when his disease was at its height.
- No ethnic, racial, religious, occupational or sexual group is immune to the disease of alcoholism.

The two prerequisites for acquiring the disease are: (1) that you are human and (2) that you have somehow, sometime, begun drinking alcohol.

The Bureau of Naval Personnel estimates conservatively that there are more than 30,000 alcoholics on active duty in the U. S. Navy. Since pilots are humans who are in almost daily contact with alcohol, it seems plausible that some of them could acquire the disease.

To get a preliminary look at this possibility, I recently began a study of the alcohol histories of 70 pilots who were hospitalized for a variety of reasons on the Neuropsychiatric Service of Bethesda Naval Hospital during the period 1960-1970. A review of their hospital records revealed the following preliminary findings:

- 22 percent were diagnosed as having chronic alcoholism.
- 35 percent were drunk or toxic from some other drug (unprescribed) during the admission physical examination.
- 54 percent were heavy drinkers by history.

Most of the patients in this group were underdiagnosed. Had more stringent diagnostic criteria been used, the incidence of alcoholism would have been around 40 percent. Although the phenomenon of underdiagnosing could be the subject of a separate study, I will offer three speculative observations:

- Physicians have since time immemorial looked upon compassion and "doing no harm" to the patient as one of the noblest traditions in the art of medicine. And since alcoholism is a stigmatizing disease, we tend to underdiagnose.
- Most physicians don't really know much about alcoholism. (The National Council on Alcoholism, Inc., estimates that only about 1,000 physicians in the country are really knowledgeable about alcoholism.)
- If the physician himself, or a significant person in his own private life, is an alcoholic in some form, then the physician probably has an unconscious bias which hampers his diagnostic ability of the disease.

To show how the ideas I have advanced here apply to real life situations in aviation, I will cite the highlights of three case histories.

Case 1. This 40-year-old commander, an aviator, was hospitalized because he was unable to get into his airplane for a scheduled flight. He came from teetotaling parents and had always considered himself only a social drinker. Because of his wife's drinking problem, he began drinking heavily to control his anger, depression and inability to sleep. This led to deterioration in his work, frequent absences from home and an unsatisfactory fitness report. He joined Alcoholics Anonymous (AA) and became almost totally abstinent, but relapsed a short time later to uncontrolled drinking. When he was finally unable to get into his airplane because of depression, nausea and dry heaves, he was sent to the hospital with the diagnosis of Adult Situational Reaction (psychologically incapacitated due to life stresses without significant underlying psychiatric disease).

While in the hospital, he and his wife began attending AA again. After two months of hospitalization, he was discharged, not as an alcoholic but with the diagnosis of Adult Situational Reaction.

For the first four days after discharge, he drank no alcohol. On the fifth day he took a few drinks, then realized that his drinking had become uncontrollable. He could no longer drink like other people and he could not stop even though he wanted to. He was unable to care for himself and was brought to the hospital by a friend. During his second hospitalization he was more honest with himself and with his therapist. Eventually he came to the conclusion that he was an alcoholic. He attended Alcoholics Anonymous regularly and was eventually referred to a Physical Evaluation Board with the diagnosis of

Chronic Alcoholism.

Among the telltale signs which might have raised the suspicion of alcoholism were teetotaling parents, symptomatic drinking (drinking to control depression, rage and insomnia), deteriorating work performance, crumbling marriage, going on the wagon frequently, alcoholic gastritis and, finally, uncontrolled drinking. As it was, the patient had to get much sicker and be hospitalized a second time before the proper diagnosis was finally made.

Case 2. This 48-year-old Air Force pilot, a lieutenant colonel, was hospitalized because of head trauma and convulsions. He described himself as a moderate drinker until several weeks before admission when he noted an increase in his drinking and an increase in his alcohol tolerance. On the day of admission, he fell out of his chair at work, struck his head and was thought to be having a convulsion. While being examined by a physician at the station hospital he had a documented grand mal seizure. He developed visual hallucinations, became delusional, disoriented, combative, and attempted to escape from the intensive care unit. He slowly recovered and was discharged, fit for full duty three weeks later with the diagnosis of Situational Reaction.

Although this patient was given the diagnosis of Situational Reaction, there is strong evidence here that a drinking problem of addiction proportions existed.

Case 3. This 42-year-old commander, a Naval aviator, began drinking heavily when his first marriage ended. He continued drinking and his work, reputation and second marriage deteriorated. Although his wife and his superiors were aware of his excessive drinking, they said nothing to him about it. On his next tour of duty he flew in combat from a large aircraft carrier, although his drinking had become so excessive that he was repeatedly cautioned about it. Nevertheless, he received a bronze star and was promoted to commander. On his next duty station he began drinking every morning before going to work. He continued drinking heavily, got an unsatisfactory fitness report, and was hospitalized with the diagnosis of Compulsive Personality.

On admission he was tremulous, had hypertension and abnormal liver function tests. He denied alcohol excess and felt that a change of duty station would solve his problems.

In the hospital he made a superficial adjustment, then went AWOL and telephoned several of his previous commanding officers to learn whether they had considered his drinking excessive. They confirmed his fear that they considered him to be an alcoholic. After two weeks of heavy drinking, he returned to the hospital. For the first time he seriously considered himself to be alcoholic, began to cooperate with his therapist, worked with Alcoholics Anonymous and willingly took the drug Antabuse. After three months he was discharged to duty with the diagnosis of Chronic Alcoholism.

This patient's alcoholism was obvious by a long history of heavy drinking, deterioration of his work, dissolution of two marriages, morning drinking, repeated hospitalizations for alcohol-related problems, abnormal liver function tests, and breaking through of antisocial behavior in an effort to maintain his heavy denial.

My experience as a flight surgeon and psychiatrist suggests to me that the incidence of alcoholism in the Armed Forces and among pilots is probably higher than our current statistics indicate. About one in eight current VA hospital patients suffers from alcohol-related disabilities; and alcohol-related disorders treated in VA hospitals doubled between 1965 and 1969. Yet the disease continues to flourish because of our own ignorance about alcoholism; because we sometimes naively rationalize that to help a patient deny his treatable illness is the same as being compassionate; because we mistakenly concern ourselves with the stated amount of his drinking rather than with the destructive effects which the drinking has on his health and his professional and social functioning; and because we ourselves may be developing the same illness—and the denial enables both us and our patients to keep the disease going.

Alcoholics are sick people and the higher the patient's rank or prestige, the better chances are that the patient will *not* get proper treatment, or even a correct diagnosis. In this way we lose some of our best people at the height of their productive years. We have a responsibility to patients with drinking problems. We must learn new information about alcoholism just as we update our knowledge about other diseases which might have been dealt with scantily when we went through medical school, and we must learn the art of tactfully and firmly confronting the patient with his illness.

If we do this, we will discover that there is real professional satisfaction in treating this disease because, numerically speaking, alcoholism is the most untreated treatable disease. Most alcoholics, if treated successfully, become very productive, happy, grateful people, even more so than other patients who have recovered from other diseases.

Continued from page 5

SPOTLIGHT ON MAINTENANCE

offer to the present, particularly when it is applied to the area of maintenance.

How often have we been guilty of examining the broad area of maintenance, more or less, in the dark by either looking at individual problems for correction or by overlooking any implications maintenance may have had in causing some mishap? How often have we focused the bulk of our attention on pilot or other factors associated with some particular mishap, and given only cursory attention to any maintenance-related ones that, perhaps, were indirectly involved? Yet, had these maintenance deficiencies not been present, the mishap may possibly have been averted. For example, the aircrew of a UH-1 departed an LZ without receiving a weather briefing, and consequently did not know the density altitude or the exact wind conditions. With passengers aboard, the gross weight of the aircraft was more than 9,000 pounds. Density altitude was 9,400 feet.

Although the pilot could have repositioned the aircraft 300 additional feet away from the tree line, he did not and takeoff was begun from a point approximately 295 feet from the trees. When about 100 feet away from the tree line, the pilot entered a left turn. Rpm decayed and the aircraft struck some trees. Flight was continued but altitude could not be maintained and the aircraft descended, struck additional trees, then crashed. The aircraft was destroyed and several occupants were killed.

Besides the obvious factors involved in this accident, another one showed up during the accident investigation: Needed engine power was not available at a critical time because of severe compressor erosion—erosion that was not noted when maintenance was performed on the turbine blades a few flight hours before the accident. In addition, accident investigators suspect that required information *not* recorded from the TEAC may have contained indications of engine problems associated with the erosion found.

The fact remains that while maintenance factors are not predominant in the majority of mishaps, they are often decisive ones in many of them. How often and how decisive? For these answers we need to pull

Inadequate lubrication caused tail rotor hanger bearing failure

Maintenance checks revealed no cause for engine malfunction symptoms and aircraft was continued in operation—until engine failed

maintenance out of the background and put it in the limelight where we can take a good, hard look at it.

During the past fiscal year (1 July 75-30 June 76) 203 mishaps resulted from maintenance-related cause factors. Of these, 13 were major accidents; 3, minor ones; 14, incidents; 14, forced landings; and 159, precautionary landings.

Collectively, they resulted in 12 fatalities, 11 major injuries, 6 minor injuries and the destruction of 8 aircraft. The dollar cost for damaged and destroyed equipment totaled nearly $3¼ million. Although in many of these instances proper action by crewmembers could have prevented the mishaps, the fact remains that had maintenance discrepancies not been present, the mishaps would not have occurred.

Consider the single, maintenance-related ground accident that occurred during this period. When performing a maintenance operational check, the pilot of an OH-58 failed to ensure the throttle was closed, and started the engine with it in the open position. When the engine started, the pilot realized the throttle was open but could not abort the start because N1 was binding in the open position. The engine accelerated rapidly, rotating the aircraft 45 degrees on its pad. The pilot finally shut the engine down by means of the fuel shutoff valve—but not before the aircraft had sustained damages of approximately $26,500.

The importance of turning the "spotlight" on this particular mishap lies in that it points out the absolute necessity of keeping the established system of checks and balances intact. In this instance, the mechanic had replaced the N1 bolt. However, he had overtorqued it, causing binding of the controls. The tech inspector checked the bolt for correct installation and safety but failed to check for freedom of movement. Finally, as related, the pilot not only failed to ensure freedom of movement but also neglected to note that the throttle was open before he started the engine. But often-times, the pilot plays no active role in the maintenance-related events that lead to a mishap. In such instances he unwittingly becomes an unsuspecting victim.

This type of thing recently happened to one pilot. While a UH-1 was in a normal climbing turn follow-

ing a missed approach, the short shaft failed. The result was one major injury, one minor one, and a destroyed aircraft at a cost of more than $293,000. The cause? Lack of lubrication. Investigation showed *no evidence* of lubricant.

Then of course, there are those mishaps caused primarily by the mechanic. Fortunately, most of these are precautionary landings. In one instance, the mechanic left the battery filler caps loose and the cockpit became filled with an odor similar to that emitted by an overheated electrical component. In another instance, the ram air door of a U-8F was improperly adjusted and induction inlet icing occurred. Other problems included overheated batteries caused by improper servicing or by voltage regulators being set too high, and compressor stalls resulting from improperly adjusted variable inlet guide vanes and bleed bands.

One minor accident resulted after both alternators failed on a T-42. This placed a heavy drain on the battery, and caused total electrical failure, necessitating that the gear be extended manually. Failure of the pilot to ensure the gear was fully extended resulted in the accident. Inspection revealed a broken field wire on the left alternator. The bearings and bushings on the right alternator were worn and the belt was loose. This particular mishap points out a maintenance problem area that often does not receive the attention it deserves. It concerns the potential hazards that are permitted to exist—not by errors made during the performance of maintenance work—but by the failure of maintenance to take sufficient action to identify existing discrepancies for correction. This situation is sometimes compounded by failure of other personnel, such as aircrews, to perform their duties as required. Consequently, an aircraft with serious shortcomings may be operated for lengthy periods of time by crewmen unaware of any existing deficiencies—until some emergency arises.

A case in point concerns a UH-1 that had to be autorotated over "unsuitable" terrain after the engine failed abruptly. Although crewmen escaped injury, damages to the aircraft totaled nearly $80,000. Inspection revealed the metal spray material installed during depot overhaul separated from the centrifugal compressor housing and jammed the centrifugal compressor.

This caused the breaking away of sections of the inner walls and housing and heavy wear of the compressor vanes, resulting in major heat damage to the hot section and seizure of the compressor rotor. Separation of the spray coating was caused by corrosion between the material and the housing and most probably resulted from improper surface preparation prior to the spray process.

Engine failed after mechanical malfunctions had been evaluated by "questionable and unsound procedures . . ."

However, maintenance had several "trys" at this engine before it failed, as symptoms that all was not well had been noted by pilots and written up in the DA Form 2408-13 on numerous occasions. Unfortunately, when routine checks did not reveal the problem, maintenance personnel did not pursue it further. Consequently, inadequate troubleshooting procedures allowed the cause to go undetected until the engine failed.

What makes this accident even more significant is that the supporting unit had an outstanding reputation in the area of maintenance. As a matter of fact, an inspection conducted shortly after this accident revealed no maintenance discrepancies. However, it did reveal related ones. These included noncompliance with test flight requirements, noncompliance with DER/HIT checks and 7-day runups, and in the case of the aircraft involved in the accident, noncompliance with 7-day runups and engine preservation requirements for a period of 4 months at another facility where the aircraft had undergone retrofitting.

A similar accident involving an aircraft from another unit had more tragic results. The crash that followed engine failure resulted in multiple fatalities and destruction of the aircraft. Once again, engine problems had been written up but maintenance had not taken proper and timely action to determine the cause.

A third major accident occurred after the tail rotor hanger bearing assembly of a UH-1 failed. This accident resulted in fatalities and the destruction of the aircraft. The failure was of a progressive nature and was caused by lack of lubrication.

A minor accident involving a fixed wing aircraft occurred when the landing gear failed. Maintenance

personnel had not made a thorough inspection of the landing gear following a previous ground mishap and did not note cracked components.

Sometimes a special problem is posed when some assembly or component is functioning properly but has a history of failures and replacement. Such was the case of an aircraft that was destroyed after a fracture developed in one link of the tail rotor silent chain, jamming the antitorque control. The aircraft had a history of chain failures and the policy adopted was "fly it and watch it." This crash resulted in major injuries to all occupants.

Then we find those instances that can properly be attributed to negligence. In this particular one, the master caution light of an AH-1G flashed intermittently. Following the precautionary landing, inspection revealed the chip detector had not been installed after an oil sample had been taken. In addition, the 90-degree gearbox chip detector was found disconnected, and both retaining ears were found broken on the 42-degree gearbox chip detector.

One thing that becomes clear is that we must examine the role that maintenance plays in safety in conjunction with the entire safety program and not apart from it. It is not so much that "poor" maintenance causes mishaps as it is that effective maintenance can prevent mishaps. As harsh as this may sound, it isn't enough to say: "This maintenance-related mishap is the first one our unit has had in more than 4 years. Look at all the hours we've flown." That is somewhat like the man who started an auto trip from the west coast to the east, and as he neared his destination, his car skidded into a telephone pole. What if he then said, "Well, look at all the poles I missed"? If he could have missed that one too, then his reasoning was not exactly overflowing with logic.

Granted, some special situations sometimes arise that negate our best efforts to prevent mishaps. A recent precautionary landing was made after the master caution light of a UH-1 flickered and the pilot noted a decrease in transmission oil pressure. Inspection revealed that a loose clamp at butt line 14, station 166, water line 21, allowed the DC trunk wire bundle to chafe against the oil tube assembly, causing loss of transmission oil. This area is not subject to routine maintenance and is virtually impossible to see. But with few exceptions, we can prevent mishaps from maintenance-related causes.

Where does the answer lie? A computer readout cannot furnish recommendations nor can it even provide such data as physical and mental condition of maintenance and related personnel and their habits. It cannot show whether they are working in a field of their choice or in one they may simply have been assigned to, perhaps against their wishes. We can go on and on about what a computer readout cannot do. The important thing is that it can show us the problem areas as they relate to the entire safety program. Beyond that, the solution lies with us. And it is about as old as Army aviation itself. It begins with the old cliche of maintenance by the book—not just during any particular maintenance job but in all areas. For example, consider the stipulation for 7-day engine runups and engine preservation requirements. These requirements have not been arbitrarily established. Yet, we sometimes overlook them. Would we go into a grocery store, buy a package of frozen fish, and then contrary to the instructions printed on the label—to store in the freezer until ready to cook—would we place the fish in the pantry with our canned goods? After all, we plan to cook them in a day or two. Yet, when it comes to thousands of dollars worth of engines—and our own safety—we somehow feel it will be all right to let the matter ride for just a few days.

Well, that's where it all begins—with technical manuals and related publications. But we have many more factors to consider. What about the training and experience level of the mechanics? Are they experienced on the type aircraft and equipment they are maintaining? How are they kept current of changes in procedures or equipment? Is any type of OJT program in progress? If so, is it efficiently administered? Is ample supervision provided in every area of maintenance? Does this supervision also concern itself with human factors as well as with maintenance policies and procedures? Is necessary supporting and test equipment available? Is it properly maintained? The same general type of questions can be asked about quality control personnel. And what about the pilots? Do they support maintenance by always performing thorough preflight inspections and cockpit and operational checks? Finally, does command supervision ensure there is no breakdown among the functions of maintenance, quality control and aircrews so that the system of checks and balances remains intact?

These are just a few of the questions we can ask ourselves. The answers we get can effectively point out problem areas for correction. And now is the time to turn the spotlight on maintenance, identify deficiencies, determine needs and take positive corrective action—before additional mishaps can occur.

THREE BLADED HUEY

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THE TITLE "Three-Bladed Huey" implies increased aerodynamic efficiency. However, in this tale, the three-bladed UH-1 significantly reduced aerodynamic efficiency to the point of near disaster.

One December morning in the Republic of Vietnam, a lieutenant inspected a UH-1D in preparation for a milk run to a nearby outpost. The mission was to deliver five salvageable main rotor blades to be used in construction work.

After preflight, the lieutenant walked over and inspected the unusual sling load—five blades fastened together by iron construction rods driven through the blades and the rods crimped together. The thought of aerodynamic forces acting upon the blades when passing through effective translational lift flashed through the lieutenant's mind. However, this thought was partially erased after inspecting the iron rods to see that they were securely holding the blades.

The lieutenant told the crew chief to constantly monitor the load after takeoff. Since it was a short flight within the local area, no copilot was used and a maintenance supervisor flew left seat. During runup checks, the lieutenant determined that the electrical sling release was inoperative, so a number of mechanical release checks were made to ensure proper sling release.

The helicopter was brought to a hover and a hover check was completed. After the load was hooked up, the helicopter slowly rose to bring the main rotor blades from the horizontal position on the ground to a vertical position with the blade tips still on the ground absorbing blade weight. Power was brought in and takeoff was initiated with a slight margin of reserve power remaining.

Before translational lift was reached, the crew chief reported "load stable." Passing through translational lift, the aircraft began rocking and the lieutenant heard a garbled cry over the intercom that sounded like, "blades separating!"

At that moment, with airspeed about 50 knots, a loud crack was heard from the right side and the aircraft became momentarily uncontrollable. The cyclic tried to sweep the cockpit and the aircraft rocked violently as it yawed sharply to the right.

The lieutenant, who assumed that the load had swung up and made contact with both the main rotor system and tail rotor system (making the tail rotor system inoperative), had two priority actions in mind (to say it mildly)—to jettison the load which was done manually, and to get more forward airspeed because of suspected tail rotor failure.

The aircraft became fairly stable upon jettisoning, but vibration became more severe with increased airspeed. The lieutenant accepted 50 knots and checked tail rotor pedals, surprisingly finding the aircraft could be controlled. Because of severe vibration throughout the aircraft and knowing he had tail rotor control, the lieutenant elected to make a forced landing straight ahead into a rice paddy. On final, the vibration lessened as airspeed decreased and landing was made without incident, but with a great sigh of relief.

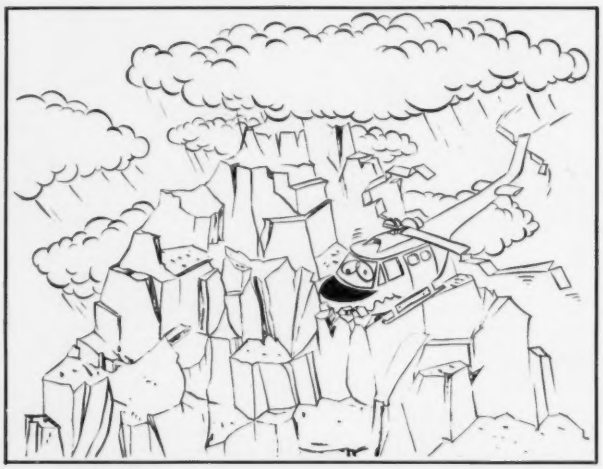
After shutdown it was discovered that one of the main rotor blades had been hit and was badly damaged two-thirds of the way out from the main rotor hub. According to people who watched from the ground, after passing through translational lift, the aerodynamic force of the blades was great enough to straighten out the crimped steel rods that were holding them together.

When the rods straightened out, the five main rotor blades opened up like a Chinese fan under the aircraft and began flying. One of them flew up on the right side and tried to enter the main rotor system, but luckily it deflected downward after contact.

A three-bladed Huey is not very efficient. I tell this tale (yes, that lieutenant was me) only because of the old adage: "Experience is the best teacher and to learn and gain experience from others is golden."

Take heed and beware of unusual sling loads.

briefs that teach



weather to go or not

A UH-1H with three crewmen and eight passengers was to fly to three locations, then return to camp. The local weather was briefed by the operations officer. This weather briefing was ground operations oriented, and was not intended to replace a DD Form 175-1 weather briefing. Though a weather ship made a local check earlier that morning, a flight weather briefing, which would have given the forecast weather in the local area, was not obtained for that day's flight. The weather at the time of takeoff from the camp was reported to be VFR with ceilings at 1,500-1,600 feet agl with good visibility. However, indications were that it was deteriorating.

The flight to the first location went well and two passengers were dropped off. The two passengers noticed that the weather in the mountains to the north, the second dropoff point, was bad. They said the peaks were covered with clouds and it was raining.

The crew delayed takeoff for several minutes while they discussed the weather, then decided to go. They crashed while climbing along the contours of the mountains en route to the second LZ.

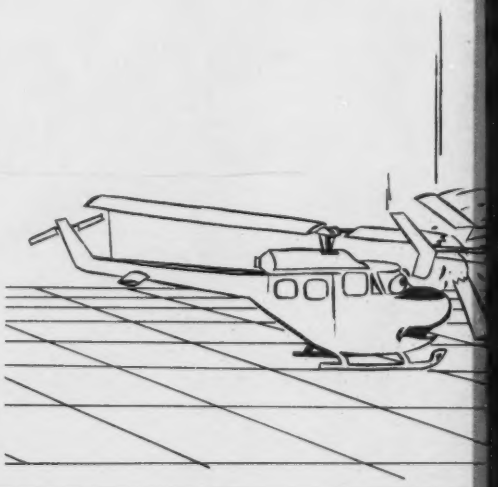
Crew error was the single most significant cause of this accident. The pilot did not get a valid weather forecast for the local area nor file a local DD Form 175. He flew into observed marginal weather conditions, and continued to operate under these conditions as the weather deteriorated further, rather than abort the mission.

look before you leap

During preflight of his OH-58, the pilot made a mental note that a UH-1 was parked directly behind him. During runup, he was unable to transmit or receive on the FM radio, so he used the VHF radio with "loud but distorted results."

The pilot was told to depart at his own discretion and was reminded that a UH-1 was parked behind him. Picking the aircraft up to a hover, he began moving to the rear. The distance from the OH-58 to the UH-1 was 100 feet from mast to mast. Sixty-two feet from where the OH-58 left the ground, its rotor blades hit the forward main rotor blade of the UH-1. The rotor and transmission were damaged, but the OH-58 came to rest upright.

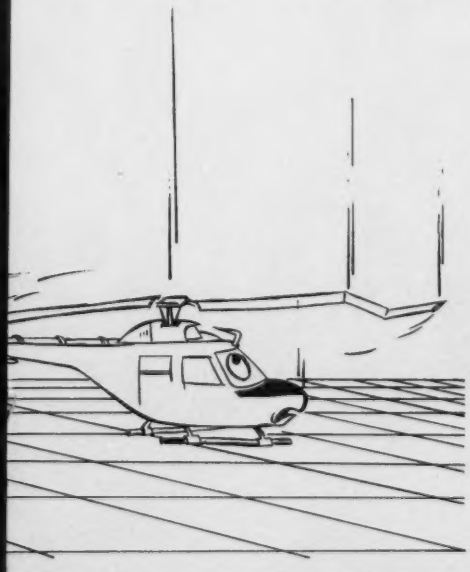
The pilot's instinctive reaction to roll off the throttle and jam the collective down probably prevented far worse damage to the aircraft and possible injury or death to

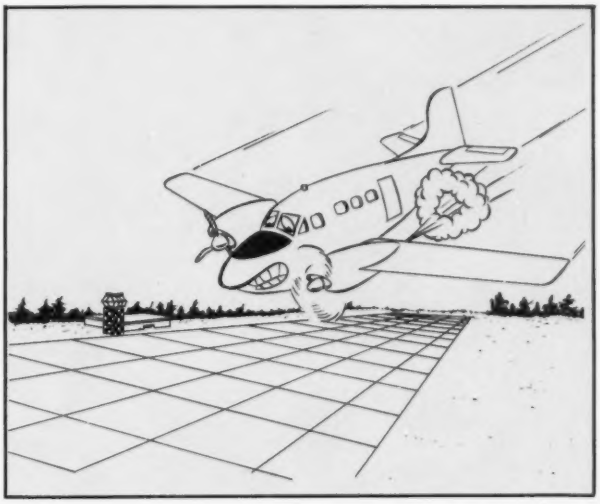


the passengers.

Several things contributed to this accident.

- No ground guide was used even though four persons were available to perform this service.
- The pilot reacted instinctively to an established pattern of backing out of parking spaces.
- Parking spaces, which were on an active runway, were arranged so that a backward hover was the easiest way to exit the parking area.
- The pilot arrived at the airfield 25 minutes before takeoff, probably causing him to hurry through his takeoff duties. The unit SOP called for arrival at the airfield 1 hour before takeoff.
- A lack of suitable ground handling equipment resulted in the two aircraft being parked in a relatively hazardous position.





misfigured

The copilot filed a flight plan while the pilot preflighted the U-8. The aircraft took off, made one stop to pick up two passengers, then flew for 5 hours before next stopping for fuel.

During the approach to the airport for fuel, the pilot had some difficulty with the nose gear. The gear was recycled. The mechanical nose wheel indicator showed down in both up and down gear positions. A request was approved for a flyby for visual inspection of the gear by the tower. The pilot made a low approach and the tower told him that the nose gear appeared to be down. The aircraft was cleared to land. Power was advanced to takeoff and a go-around was made to return for landing. At approximately 750 feet, a right crosswind turn was initiated. At this time the No. 1 engine sputtered, smoothed out, surged and quit. The pilot banked right to line up with the long axis of an open field and the No. 2 engine quit. The aircraft crash-landed with gear extended and propellers unfeathered.

Fuel exhaustion was due to improper preflight planning. Fuel consumption was computed for cruise flight at the appropriate altitude and temperature as prescribed in the dash 10. However, ground operations, takeoff, and climbs were not included in the planning. Fuel exhaustion occurred nearly three-fourths of an hour before the pilot's estimated time.

AH-1S AVIONICS

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WITHIN THE last few years Army avionics have changed at a tremendous pace in order to enhance and improve mission effectiveness, including new capabilities for the IFR and NOE environments. Communications and navigation equipment have undergone complete redesign making them lighter, smaller, more reliable and more efficient. Many new types of avionics will soon find their way into Army aircraft.

Navigation instrumentation has not taken a back seat. Integrated instruments will conserve cockpit panel space and ease pilot workload by presenting a more "readable" display with reductions in scan distances.

When is all of this going to happen? UTTAS and AAH will have these new avionics and instrumentation but long before that there will be an aircraft in the Army inventory which will incorporate or have provisions for almost all of the latest generation avionics and integrated instrumentation. The aircraft is the new AH-1S TOW Cobra, now in production.

First, let's see what has been done with the AH-1S HueyCobra in the area of navigation instrumentation. The pilot's radio magnetic compass indicator (RMI) and course deviation indicator are gone. In its place is a horizontal situation indicator (HSI) which essentially combines the functions of these two instruments. It can be described as a multi-navigation display which presents a dynamic picture of the current horizontal position of the aircraft with respect to centerline and a bearing derived from any number of navigation devices.

A control panel will be used for the HSI to provide flexibility to display either VOR/ILS/GS, Doppler navigation or FM homing on the course deviation bars. The HSI also will have two bearing pointers. The first pointer can display Doppler bearing to destination, VOR or ADF and the second pointer either ADF or VOR, all selectable by means of the HSI control panel.

Since the pilot's standard RMI is gone, control of the gyromagnetic compass is shifted to a small control panel placed in the rear of the pilot's console. The copilot/gunner's RMI is integrally lit.

The attitude director indicator (ADI) replaces the pilot's attitude indicator and turn and slip indicator. It will have pitch and roll trim, an inclinometer and a rate of turn indicator which is driven remotely by a turn rate gyro. The ADI also will have horizontal and vertical deviation pointers that duplicate the horizontal and vertical deviations of the HSI. Retracted from view are cyclic roll and pitch and collective command bars which can be used with a flight direction system. In later models of the AH-1S the attitude sphere will be driven by a new, highly accurate attitude gyro. A gyro fast erect switch will be added to the pilot's instrument panel.

The copilot/gunner's attitude indicator is a new 3-inch self contained unit with an inclinometer and pitch trim.

In the communications area FM, VHF and UHF radios are replaced by much lighter, self contained radios, which altogether save some 56 pounds of weight and 355 watts of primary power (while transmitting) over the old sets.

The FM and VHF sets (ARC-114A and 115A) are identical to the ones currently being used by the OH-58 Kiowa, OH-6 Cayuse and the later model UH-1 Huey. The UHF set (AN/ARC-164) however, is a brand new transceiver, common with the U.S. Air Force's new UHF radio. The

The First of 193 AH-1S Helicopters

AN/ ARC-164 can transmit and receive on 7,000 channels from 225.00 MHz to 399.75 in 25 kHz steps with a capability of preselecting 20 channels.

The VHF radio will be in the copilot/gunner's instrument panel while the FM and UHF radios will be in the pilot's instrument panel and console respectively, The intercom control stations (ICS) are identical to the ICSs found in the later models UH-1H, OH-58 and OH-6.

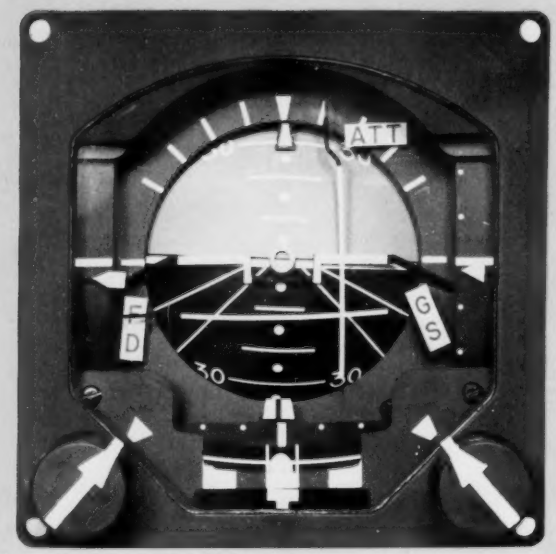
In the area of navigation the ADF has been replaced with a newer unit having a higher directional accuracy. The tuning range has been increased from 190 - 1,750 kHz to 100 - 3,000 kHz.

Until this point in time the navigation capability of AH-1 Cobras was limited to ADF and FM homing. An IFR capability to fly established airways will be included in the AH-1S with the installation of a new Army navigation receiver (AN/ARN-123) consisting of VOR, localizer, glide slope and marker beacon receivers. The omnireceiver is essentially a commercial unit adopted for military use. The VOR/LOC portion of the receiver will have 200 channels (160 VOR, 40 LOC) as opposed to the 100 channels of the standard Army omnireceiver (AN/ARN-82). VOR, localizer and glide slope are displayed on the HSI via the HSI control panel. Course selection is done by means of an omnibearing select knob and a digital course readout on the HSI. Marker beacon visual indication is a single light. Outer, middle and inner beacons will have to be distinguished aurally.

To round off the AH-1Ss navigation capability, later models will have a tactical area navigation system usable for all modes of flight, including NOE. This lightweight Doppler navigation system (AN/ASN-128) is self contained, meaning it does not receive information from ground stations. Navigation information is computed from aircraft heading and accurate ground velocities obtained by measuring the frequency shift between radar energy transmitted to and reflected from the ground (Doppler effect).

The copilot/gunner will have control of the Doppler unit, entering coordinates of current starting position and coordinates of desired destination(s). Doppler information presented to the pilot will then be in the form of distance to

Horizontal Situation Indicator



Attitude Director Indicator

GLOSSARY

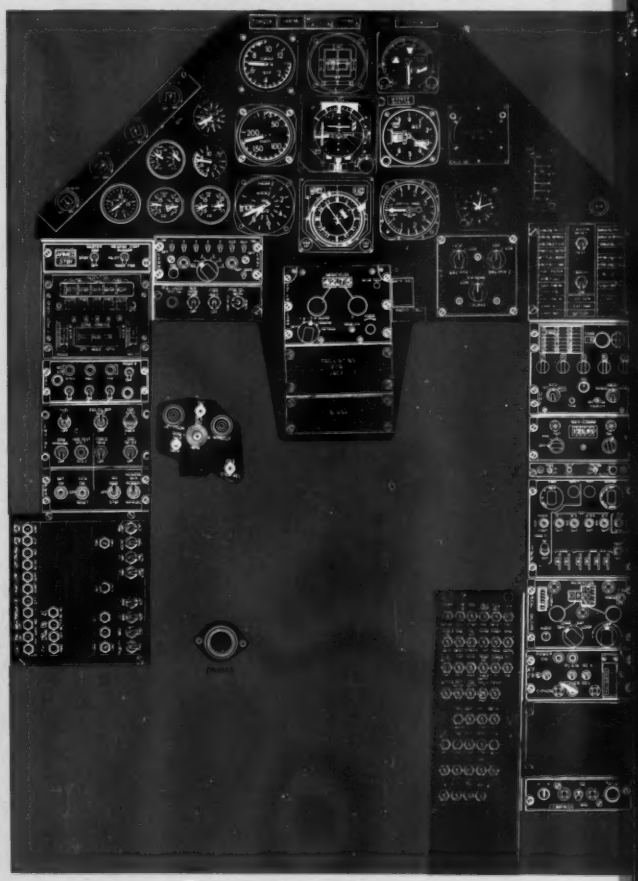
AAH	advanced attack helicopter
ADF	automatic direction finder
ADI	attitude director indicator
CONUS	Continental United States
CRT	cathode ray tube
FM	frequency modulated
GS	glide slope
HSI	horizontal situation indicator
ICS	intercom control station
IFR	instrument flight rules
ILS	instrument landing system
IR	infrared
IVSI	instantaneous vertical speed indicator
kHz	kilohertz
LOC	localizer
MHz	megahertz
NOE	nap-of-the-earth
RF	radio frequency
RMI	radio magnetic compass indicator
TOW	tube-launched, optically-tracked, wire-guided
UHF	ultra high frequency
UTTAS	utility tactical transport aircraft system
VHF	very high frequency
VOR	VHF omnidirectional range

destination in kilometers, angular deviation from the course and relative bearing to the destination, all displayed on the HSI via the HSI control panel. Because of limited copilot/gunner panel space the Doppler will replace the VHF radio when used.

All AH-1S Cobras have provisions for a low altitude radar altimeter which will be installed as soon as altimeters become available. The radar altimeter located directly to the right of the pilot's TOW steering indicator will present altitude from 0 to 1,500 feet with a meter movement and a digital readout with adjustable high and low warnings.

As with the radar altimeter the AH-1S will have a radar warning receiver as soon as it is available. The radar warning receiver has a 3-inch CRT display and will be located directly to the right of the IVSI. This device will alert the pilot that he is not only being illuminated by hostile radar but it also will provide the relative strength and the direc-

AH-1S Pilot's Instrument Panel and Console



tion of the source.

The avionics that are retained from the AH-1G/Q Cobras essentially are the transponder and the gyromagnetic compass system, but even that won't be for long since the transponder will be replaced with a diversity type transponder (AN/APX-100) after the first 66 AH-1Ss. Diversity means that the transponder has two RF inputs from two antennas, one on top and one on the bottom of the aircraft to prevent airframe masking of the transponder signals.

Even with this new avionics/instrumentation configuration, future plans are being considered to add equipment such as fire control systems, ranging airborne laser tracker, low range omnidirectional airspeed indicator, proximity warning device, IR suppressor and IR jammer.

Eventually all Cobras will be brought up to the configuration of the production AH-1S. Until the UTTAS and AAH are fielded, the new AH-1S Cobra will carry the Army's most advanced avionics and instrumentation.

IFR

CW2 Alvyn Chapman

Department of
Undergraduate Flight Training
Ft. Rucker, AL

HIGH TOWER, Army copter 12345, one five southwest for landing, over."

"Army copter 12345, this is High Tower; be advised the control zone is IFR, weather 800 broken, visibility one mile, ground fog and haze, GCAs are available; request your intentions."

"High Tower, Army copter 12345, please stand by, over."

How many times have you been in this situation and turned to your copilot and said, "Let's request a special VFR; we don't have the time."?

Why do Aviators request a special VFR (visual flight rules) clearance in a situation such as this? They probably didn't stop to think when was the last time they made an instrument approach, or for that matter even a GCA (ground controlled approach). In fact, may be these Aviators turned down the GCA because there was some doubt in their minds about their proficiency and their ability to complete it. Can you remember the last time you were trying to make it home flying VFR in marginal weather conditions and found the weather progressively getting lower and lower? The ground was coming up fast and the ceiling was coming down faster. You found yourself 200 feet AGL (above ground level), then 150 feet AGL, 100 feet — visibility decreasing rapidly.

We all have found ourselves in this situation at one time or another. The point is what are we doing down there when we could be at a much higher and safer altitude. An Aviator naturally feels safer when he has visual contact with the ground, and the thought of going IFR (instrument flight rules) creates great anxiety when he is unprepared.

Whatever happened to the possibility of a precautionary landing when flying VFR in marginal weather, with or without minimum fuel? Could it be some Aviators think it would be embarassing — what would their peers think?

When all the requirements are met, what is so difficult about filing IFR? Could it be we are trying to avoid a little more flight planning and waiting a few extra minutes for an IFR clearance? Possibly you could be required to enter one of those dreaded holding patterns somewhere, which is highly unlikely.

AR 95-1 at this writing states: "All aircraft assigned to active Army units which are instrumented for IFR flight and have an instrument-rated Aviator in command will operate on IFR Flight Plans . . . ." There are exceptions to this requirement, but how many of us take advantage of these "loopholes" and use them for excuses for not filing IFR? Once Aviators become more and more familiar with IFR procedures they will find the advantages of flying on an IFR clearance will definitely outbalance the few minutes delay. Some of the safety advantages gained by an IFR clearance are aircraft separation and radar coverage.

All Aviators are required to log a minimum number of hours of hood or weather time, and the plain truth is that most of them put that H on the dash 12 just to fill the requirements whether they had a hood on or not. Much benefit can be obtained from that hood time if used properly and on an IFR clearance.

The objective of the Army aviation instrument training program as outlined in AR 95-63 is " . . .to have each Aviator obtain and maintain an instrument qualification." Just because you have a current instrument ticket doesn't mean you are proficient at flying instruments.

The point is that *the only effective way to maintain total instrument proficiency is to file and follow IFR flight plans whenever practical.* If you do this, when the time comes when it is necessary for you to enter instrument conditions, *you will be ready.*

If you have a question about personal

equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36362

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

New Style Coming

Army aviators can expect a new style Nomex flight jacket and trousers in the future. However, this new style will not become standard until existing stocks of the present Nomex are depleted.

The velcro hook on the present jacket has presented a problem as the sleeve cuffs rub on the velcro hooks when the hands are inserted into the pockets. Pocket flaps are being added to the new jacket and the hooks are being relocated to prevent fraying of the cuffs.

The standard velcro fasteners on the pant cuffs are being replaced by drawstrings. This change, however, does not affect the recommended method of wear. Pant legs should extend over the boot down to the ankle area and the drawstrings pulled tight and tied. To ensure proper length, pants should be long enough not to ride up above the boot top when the wearer is in a "full squat" position. Nomex is designed for a loose fit to provide the best fire protection. Therefore, the drawstrings should not be removed in an attempt to sew on velcro, as the cut of the pant legs is such that sufficient material is not available for any unauthorized alterations.

Butane Lighter Fire Starter

The lifesaver survival fire starter has instructions on how to refill it. Could you supply me with the NSN for the nozzle with adapter and the butane can.

The lighter is a throwaway item when empty. No refill components were purchased. If your lighter is empty, reorder the entire system, using the following information: Fire Starter, Butane Lighter, NSN 9920-00-999-6753. Unit cost at this time is $4.15.

Fireman's Boots

Boots, Fireman's, rubber, black, 13½ inches high, in sizes 4, 5, 6, 7, 9, 11, 12, 13, 14 and 15, are not listed as an adopted Army item in chapter 8 of SB 700-20. However, sizes 8 and 10 are listed under line C-07571. Action is being taken to adopt all sizes for Army use. Availability and requisitioning instructions will be listed in the Supply Information Letter when published by Defense Personnel Support Center.

ATC action line

UNITED STATES ARMY AIR TRAFFIC CONTROL ACTIVITY

WHAT SAYS that the wind direction transmitted by the tower to a pilot shall be magnetic while wind information from teletype reports is referenced to true north?

The sources are the Federal Aviation Administration (FAA) Handbook 7110.65, chapter 1, paragraph 1k; the Federal Meteorological Handbook-1, chapter A-10, paragraph 3.5; and the FAA Maintenance of Traffic Control Equipment MTC 3.4.7.5, paragraph 4.3.3.1.

Magnetic direction has more meaning to a pilot landing or departing since heading and runway directions are in magnetic degrees. Teletype weather reports normally are used in flight planning and transmitted via long lines to many locations. It is extremely difficult to convert the true direction to magnetic when taking into account the many variations that must be considered.

Since the General Planning (GP) document only comes out twice a year, how is it updated?

The GP is designed to contain the most stable information and, therefore, is published semiannually with no scheduled Planning Change Notices (PCN). Minor changes to the GP normally will be carried on the inside front cover of appropriate Area Planning (AP) Publications (AP 1, 2 or 3). Special notices in either Enroute Supplements, NOTAMs or Flight Information Bulletins (FIBs) also may call attention to such changes. This is not to say that a significant number of changes could not generate a PCN or even a complete interim publication if changes to the system warrant it.

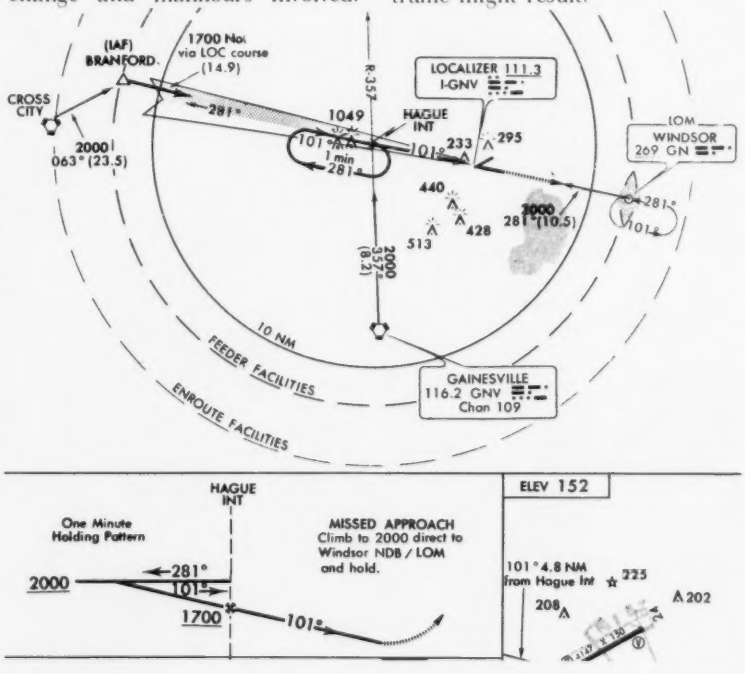
The FAA LOC BC Rwy 10 Approach Procedure, Gainesville, Muni, Gainesville, FL (Vol 9, TLUS) (see figure) depicts a holding pattern in lieu of a procedure turn at Hague Intersection.

• Is Hague Intersection considered an initial approach fix (IAF)?

• Why is a normal procedure turn not provided?

Hague Intersection is an IAF. FAA in the past felt that instrument pilots would know this and did not provide the IAF identification on charts. Recent action by the U. S. Army Air Traffic Control Activity has resulted in an FAA decision to fully identify each of these type procedural IAFs. IAFs will appear on such charts when revised for some other purpose. This schedule will reduce the cost of change and manhours involved.

The holding pattern is used to conserve airspace. The standard 1-minute pattern holding area is protected by air traffic control (ATC) for your holding operation. Procedure turn maneuvering should be prescribed for holding pattern operations so as to remain in the smaller area. When a holding pattern is used the minimum holding altitude must be within 300 feet of the final approach fix altitude. This is to assure you have an ability to arrive at minimum descent altitude in a position for landing without exceeding standard descent rates. When the 300 feet criteria cannot be met due to obstructions in the holding area, a standard procedure turn is provided. ATC will then provide separation for the greater area involved even though restrictions to other traffic might result.



A Thanksgiving Prayer

O GOD, make us worthy of the trust You have placed in us. You have planted freedom in our hearts, and have put in our minds and hands the tools with which to achieve it. You have entrusted this good land to us, and blessed us as no other nation has been blessed.

Help us to count our blessings, to name them and to express our gratitude in the responsible way we exercise our freedom. Grant us the courage to live what we believe, and wisdom to be good stewards of Your blessings. Amen

CH (LTC) Harvey J. Mills
Office of Center Chaplain
U. S. Army Aviation Center
Ft. Rucker, AL

ALCOHOL IN AVIATION:
A PROBLEM OF ATTITUDES

See Page 30